PB89-183891

Superfund Record of Decision (EPA Region 3) Henderson Road NPL Site, Upper Marion Township Pennsylvania (First Remedial Action), June 1988

(U.S.) Environmental Protection Agency
Washington, DC

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U.S. Department of Commerce
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Agency

Office of
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EPA/ROD/R03-88/049
June 1988

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EPA

Superfund Record of Decision:

Henderson Road, PA

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Henderson Road site is an active waste facility situated on 7.6 acres of land in Upper Merion Township, Pennsylvania. The land in the vicinity of the site is zoned for light industrial, heavy industrial and residential use. The site is approximately 2,000 feet south and upgradient of the Upper Merion Reservoir (UMR), where ground water is part of a public water supply serving 228,000 customers. A water supply well 350 feet southeast and upgradient of the site serves 15 employees of a lumber company. e site area is also characterized by sinkholes resulting from dissolution and ubsequent collapse of the dolomite and limestone bedrock. The O'Hara Sanitation Company (OSL) presently occupies the site with several automobile repair shops and a drilling contractor. The OSL presently conducts onsite waste storage and waste recycling operations. An anonymous phone call to the Pennsylvania Department of Environmental Resources (PADER) in 1977 stated that ABM Disposal Service Company transported and then injected industrial waste into a well located inside the OSL maintenance garage. Limited information is available on the types or volumes of materials disposed of before PADER was notified of injection activities at the site. Results of PADER and EPA sampling conducted between 1977 and 1981, and ground water monitoring conducted in 1986 revealed the presence of organic and VOC contamination both
(See Attached Sheet)

17. Document Analysis a. Descriptors
Record of Decision
Henderson Road, PA
First Remedial Action
Contaminated Media: gw, sediments
Key Contaminants: organics, VOCs

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. ability Statement

19. Security Class (This Report) None

20. Security Class (This Page) None

21. No. of Pages 131

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See Instructions on Reverse

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A/ROD/R03-88/049
nderson Road, PA
First Remedial Action

16. ABSTRACT (continued)

on and offsite. Of the 35 chemicals of concern identified at the site, fifteen were found in UMR in 1986. Certain site-related chemicals also have been detected between the site, UMR, and the adjacent water supply well. Additionally, the site is located in an area of regional ground water contamination. Studies also indicate that the central plume of contamination from the site has not yet reached the UMR, based on an estimated travel time for ground water from the site to reach UMR. However, onsite ground water is still highly contaminated and the extent of contamination in the rocks and fractures in the unsaturated bedrock has not been fully characterized. A potential might exist for increased offsite loading to the ground water. The primary contaminants of concern include VOCs and organics.

The selected remedial action for this site includes: installation of onsite and downgradient (if necessary) ground water recovery wells and treatment using air stripping with probable discharge to an adjacent stream, and possible discharge of a portion of the treated ground water onto an area near the injection well as part of the unsaturated zone treatment (soil flushing); closure of the injection well; excavation of contaminated oil pit sediments and removal of significant waste, if feasible, directly out of the injection well; installation, operation and maintenance of a carbon dsorption water treatment system at an affected offsite active well; deed restrictions fecting ground water usage; ground water monitoring; collection and evaluation of data during RD/RA phase for possible pilot testing of in-situ volatilization (ISV) of VOCs or another appropriate treatment technology in the unsaturated zone; and periodic reevaluation of cleanup goals. The estimated present worth cost for this remedial action ranges from $5,500,000 (without ISV, unsaturated zone treatment or downgradient pump and treatment) and $12,200,000 (with ISV).

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RECORD OF DECISION
DECLARATION

SITE NAME AND LOCATION

Henderson Road NPL Site
362-372 South Henderson Road
Upper Merion Township, Pennsylvania

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Henderson Road NPL Site ("the site") Injection Well Operable Unit in Upper Merion Township. The selected remedial action has been developed in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the National Contingency Plan. The attached index identifies the items which comprise the administrative record upon which the selection of the remedial action is based.

The Commonwealth of Pennsylvania has concurred on the selected remedy.

DESCRIPTION OF THE SELECTED REMEDY

This operable unit is the first of two operable units that address contamination at the site. This operable unit addresses the source of the contamination by remediation of the on-site ground water and shallow contaminated sediments, possible removal and treatment of a source of contamination in the unsaturated zone, and possible remediation of the downgradient contaminant plume. The function of this operable unit is to address ground water contamination caused by injection of hazardous substances into the O'Hara Sanitation Company garage well (the "injection well") prior to 1977 and reduce the risks associated with exposure to ground water contaminated from the injection well. The second operable unit, the Landfill Operable Unit, will address surface water, air, and ground water potentially impacted by previous landfilling and trenching on-site, in addition to potential leakage from on-site underground storage tanks.

The major components of the selected remedy include:

- installation of clusters of ground water recovery wells on-site and, if necessary, downgradient;
- air stripping of ground water and probable discharge to the intermittent stream adjacent to the site; a portion of the ground water may be reinjected to the aquifer in the vicinity of the of the injection well as part of unsaturated zone treatment ("soil flushing");

-- closure of the injection well, including excavation of contaminated oil pit sediments, in accordance with federal Underground Injection Well Program requirements and removal of significant waste, if feasible, directly out of the injection well;

-- placement of deed restrictions limiting or prohibiting use of ground water on the affected properties;

-- installation of a treatment system at water lines connected to the one off-site active well considered to be currently affected by the injection well;

-- periodic on- and off-site monitoring of ground water throughout Operation and Maintenance;

-- further data collection and evaluation of the unsaturated and saturated zones during Remedial Design and periodically during Remedial Action, leading to a determination whether to pilot test for, and possibly, institute in-situ volatilization of volatile organics or other treatment in the unsaturated zone;

-- periodic reevaluation, throughout Operation and Maintenance, of clean-up goals.

DECLARATION

The selected remedy is protective of human health and the environment, is expected to attain federal and State requirements that are applicable or relevant and appropriate to this remedial action, and is cost-effective. This remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

Ground water pumping with or without treatment in the unsaturated zone may result in hazardous substances remaining on-site above health-based levels. Therefore, a review will be conducted within five years after commencement of the remedial action and every five years thereafter, throughout operation and maintenance to evaluate whether technologies implemented provide adequate protection of human health and the environment, whether additional treatment, particularly in the unsaturated zone, is appropriate, whether progress is being made in meeting clean-up goals, and whether clean-up goals should be revised.

James Seif, Regional Administrator
EPA Region 3

RECORD OF DECISION
DECISION SUMMARY

I. SITE NAME, LOCATION, AND DESCRIPTION

The Henderson Road NPL Site ("the site") consists of 7.6 acres located at 362-372 South Henderson Road in Upper Merion Township, Pennsylvania (see Exhibit 1). The site is located in the Chester Valley, an east-west trending subdivision of the Piedmont Uplands in Southeastern Pennsylvania. The Piedmont Uplands is characterized by mature, dissected rolling hills.

The highest elevation on the site is its northwest corner, approximately 190 feet above sea level. The east end of the site, in the intermittent stream bed, is the lowest point of elevation, at approximately 126 feet above sea level. Two sloping areas characterize the site. Land surfaces slope toward the central portion of the landfill from the north, south, west, and east, at slopes of approximately two percent. At the extreme east of the site, land surfaces slope at approximately eight percent and increase to 40 percent toward the stream bed. A level area at an elevation of approximately 160 feet lies in the northwest portion of the site, north and east of the office/maintenance garage complex located on the site (see Exhibit 2). Flood plain mapping was not conducted as part of the Remedial Investigation for this operable unit.

The site is bounded on the north by the Pennsylvania Turnpike, on the south by Conrail tracks, to the east by the Southeastern Pennsylvania Transportation Authority Norristown High-Speed Line right-of-way, and to the west by South Henderson Road. O'Hara Sanitation Company, Inc. occupies the site with several automobile repair shops and a drilling contractor. O'Hara Sanitation Company presently uses the site for waste storage, waste recycling, vehicle maintenance and parking, and office facilities. Land in vicinity of the site is zoned for light industrial, heavy industrial, and residential use (see Exhibit 3).

The site is approximately 2000 feet south and upgradient of the Upper Merion Reservoir ("UMR"), where ground water is pumped at a rate of 7.5 mgd as part of a public water supply serving 228,000 customers. The site is about 350 feet southeast of and upgradient from McIlvain Lumber Company, where a water supply well serves 15 employees (see Exhibit 4).

The aquifer beneath the site and from which UMR and the McIlvain well draw water meets the requirements of a Class IIA aquifer, defined under the EPA Ground Water Protection Program as a current source of drinking water. According to the Ground Water Protection Program, Class II ground water should generally receive the very high level of protection that represents the "base line" degree of protection that is the standard of EPA programs.

The population within 1,500 feet of the site consists mainly of employees of businesses that surround the site. Within one mile of the site the total estimated residential population is 5,000. The nearest residential dwelling is 560 feet southwest of the site. The nearest school is 3,000 feet south of the site.

An intermittent stream along the eastern edge of the site flows in the direction of the Pennsylvania Turnpike, to the north of the site. The stream has no Commonwealth of Pennsylvania Stream classification. It empties into the main of the Schuylkill River which is classified as a cold water fisheries stream below the mouth of the Little Schuylkill River. Thus, the intermittent stream would be classified as a cold water fisheries stream.

There are no species of special concern or exemplary natural communities in the Henderson Road area as determined by the Pennsylvania Natural Diversity Inventory. No endangered reptiles or amphibians are expected to inhabit the area.

The Chester Valley contains highly folded dolomite and limestone rocks. Sinkholes are common in the Chester Valley, including the area of the site, due to dissolution and subsequent collapse of the dolomite and limestone bedrock.

Ground water pumping at UMR draws down water from an approximate area of 2.4 square miles, which includes the site, and ground water that is induced to flow from the bed of the Schuylkill River. UMR pumping has depressed the ground water table at the site to about 120 to 160 feet below the surface. Ground water is believed to flow from the site to the UMR via fractures and related solution features in a direction which predominantly follows strike but also has a northerly component. Based on a calculated flow rate ranging from 2.4 to 13.3 feet per day in the vicinity of the site, ground water is calculated in the Remedial Investigation ("RI") to take approximately 0.6 to 3.4 years to flow from the site to UMR. However, hazardous substances beneath the site may not move at the rate amd manner that ground water moves.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

Disposal activities related to this operable unit were initially brought to the attention of PA DER in 1977 by an anonymous phone call. The caller stated that ABM Disposal Service Company transported and then injected industrial waste into the well located inside the O'Hara Sanitation maintenance garage. Records acquired since 1977 indicate that disposal of wastes from sources into the injection well may have occurred between 1974 and 1977. Generators of hazardous substance are potentially liable under CERCLA in addition to the owners and operators.

PA DER and the EPA have conducted on- and off-site sampling since 1977. The site was proposed for the NPL in 1983. In December, 1985, an Administrative Order on Consent was signed by EPA and nine respondents for the completion of an RI and Feasibility Study ("FS"). In 1987 the site was split into two operable units (see Section IV). The draft final RI/FS for the injection well operable unit was completed in April, 1988.

Special notice letters for RD/RA of the injection well operable unit have been sent to 13 potentially responsible parties ("PRPs"). A moratorium on RD/RA activities has commenced and is expected to end on July 11, 1988. Informal discussions with PRPs indicate that a proposal to complete RD/RA activities is forthcoming. No civil law suit has been filed. Comments on the Proposed Plan from the Henderson Road Site PRP Steering Committee are included in the Administrative Record.

III. COMMUNITY RELATIONS HISTORY

The draft RI/FS and Proposed Plan were made available to the public for comment on April 22, 1988. Public comment period closed on May 31, 1988. Although opportunity for a public meeting was made available, no request for such a meeting was received. EPA met with the Henderson Road Site PRP Steering Committee, at their request, to describe the Proposed Plan and to receive additional comments on the Proposed Plan. EPA also met with Philadelphia Suburban Water Company to discuss the Proposed Plan. Finally, representatives from EPA discussed the RI/FS and Proposed Plan with the owners of the McIlvain Well, Hubing Well, and Delaware River Basin Commission. Representatives from PA DER, Fish and Wildlife Service, and National Oceanic and Atmospheric Administration have participated in development of the RI/FS since the first draft was produced.

Surface and subsurface features associated with the injection well operable unit include ground water and UMR water affected and potentially affected by disposal of hazardous substances into the injection well, assumedly between 1974 and 1977. The waste has migrated to an area beyond the injection well's immediate environs. Gross and/or dissolved contamination appears to exist in the void spaces and fractures in the unsaturated and saturated bedrock.

The Responsiveness Summary provides a response to each of the significant comments received from the public.

IV. SCOPE AND ROLE OF OPERABLE UNIT AND RESPONSE ACTION

This Record of Decision ("ROD") for the injection well operable unit addresses the first of two planned activities at the site. This ROD for the injection well operable unit addresses ground water contamination and UMR contamination caused by or potentially caused by disposal of hazardous substances into the injection well. Ground water pumping and, if determined to be feasible and cost-effective, unsaturated zone treatment, are proposed to reduce the toxicity, mobility, and volume of contaminants related to the injection well operable unit. A second ROD, for the Landfill Operable Unit, will address endangerment and potential endangerment from contaminated or potentially contaminated surface water, ground water, sediment and air related to landfilling, trenching, and hazardous waste storage at the site. Together, the RODs for the Injection Well and Landfill Operable Units will address exposure and potential exposure to all contamination resulting from site activities.

V. SUMMARY OF SITE CHARACTERISTICS

A. Contamination and Affected Media

Limited information presently is available on the types of materials disposed before PA DER was notified of injection activities at the site. 6,000 gallons of SmithKline and French waste allegedly were disposed in one occurrence in March, 1977, and records from ABM Disposal Company indicate numerous "loads" from other sources were transported to the site. However, total quantities of wastes disposed are unknown.

Results of PA DER and EPA sampling activities between 1977 and 1981 are listed in Exhibit 5. Constituents detected in greatest concentrations include toluene, 1,1-dichloroethane, dimethylbenzenes (xylenes), 1,3,5-trimethylbenzene, 1,2,4,5-tetramethylbenzene, and 2,7-dimethylnapthalene, 1,2,4-trichlorbenzene, 1,4-dichlorobenzene, napthalene, 1,2-dichlorobenzene, and 4,6-dinitro-o-cresol.

Results from on- and off-site ground water monitoring in 1986 are presented in Exhibits 6, 7, and 8. Toluene and xylenes were found in greatest concentrations on-site. However, the Risk Assessment indicates that vinyl chloride, 1,1-dichloroethane and tetrachloroethane pose the greatest proportion of the potential cancer risk associated with consumption of ground water beneath the site (see Exhibit 12.) Compounds found in highest concentration in untreated UMR water include trichloroethene, 1,1,1-trichloroethane, and carbon tetrachloride. However, the Risk Assessment shows vinyl chloride, chloroform, 1,2,3- trichloropropane and dichlorobromomethane to pose the greatest carcinogenic risk in UMR. 1,1-Dichloroethane was the most prevalent compound detected at the McIlvain well. 1,2-Dichloroethane, along with methylene chloride and trichloroethane, comprise the carcinogenic risk associated with ingestion of McIlvain well water.

B. Location of Contamination and Known Potential Routes of Migration

The presence in 1986 of plastic pellets in one on-site well, nonaqueous phase liquid in a second on-site well, and some site-related contaminants in two hydraulically-connected upgradient wells indicate that the waste has spread to an area beyond the injection well's immediate environs. Contamination has been found on-site as deep as 295 feet and as shallow as 175 feet beneath the surface in the saturated bedrock zone. Offsite, contamination has been found as deep as 505 feet in the Crooked Lane well. (This well appears influenced by regional contaminants, too.) Based on OVA readings obtained during drilling, contamination also is considered present in the voids and fractures in the unsaturated zone. No soil sampling in the vicinity of the 20 foot deep oil pit adjacent to and formerly connected to the injection well has been conducted. This pit may be a source of the toluene and xylene detected on-site.

When the injection well was used for waste disposal, the injected material passed through the unsaturated zone and saturated zone. The large solution features in the unsaturated zone may have allowed liquid and solid waste to spread both vertically and laterally. "Mounding" may have caused the injected waste to move not only downgradient, but upgradient too. For example on April 28, 1977, shortly after the last disposal into the injection well, the depth to liquid/water in the injection well was approximately 70 feet above the local water table. Water quality results, dated 1979 and 1983 at the Hubing well*, located about 1000 feet west of the injection well, and results from on-site "upgradient" sampling in 1986 support this theory of upgradient spread.

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* The Hubing well, while apparently affected in the 1970's from the injection of wastes at the site, did not exhibit ground water contamination related to the site in 1986.

Several compounds detected in ground water beneath the site have been detected in UMR since 1979, when UMR water first was analyzed for volatile organic compounds. Fifteen of the 35 site-related chemicals of concern were found at UMR in 1986. Certain site-related chemicals also have been detected between the site and UMR and at the McIlvain well.

The site is located in an area of regional ground water contamination. Two compounds, 1,1,2,2-tetrachloroethane and 1,2,3-trichloropropane, which contribute between about one-fifth fifth to one-eighth of the risk associated with untreated UMR water in 1986, were not detected at the site in 1986, (trichloropropane accounts for the second highest proportion of carcinogenic risk in one model). Furthermore, five organic compounds have been been detected in excess of health-based levels in four off-site wells not considered to presently be affected by the injection well operable unit. Exhibit 9 shows other potential regional sources of contamination.

The FS states, "it appears impossible that the central plume of contamination from the site has not yet reached the UMR", based on an estimated travel time for water from the site to reach UMR of 0.6 to 3.4 years. However, ground water on-site is still highly contaminated and the extent of contamination in the voids and fractures in unsaturated bedrock has not been fully characterized. In EPA's opinion, a potential exists for increased off-site loading to the ground water.

VI. SUMMARY OF SITE RISKS

The potential scenarios for exposure to contaminants associated with the site are:

- current or future ground water extraction on-site;
- current or future ground water withdrawals between the site and UMR;
- current or future ground water withdrawals upgradient from the injection well, where the effects of mounding still may be observed;
- current or future consumption of water at the McIlvain well;
- current or future consumption of treated and untreated UMR water.

Thirty-five chemicals of concern are affiliated with the site (see Exhibit 10). Exhibit 11 describes the various exposure scenarios modeled in the Risk Assessment and summarizes the carcinogenic and noncarcinogenic risk affiliated with each model.*

Exhibit 12 shows the carcinogenic risk associated with each chemical of concern based on exposure models used in the Risk Assessment. Chemicals of concern contributing the greatest proportion of carcinogenic risk are volatile organic chemicals. However, certain base/neutral extractable organics, acid extractable organics, and metals are included in the chemicals of concern. Exhibit 13 shows the hazard index ("HI") for individual chemicals of concern for the site, UMR, and McIlvain well. 1,2-Dichloropropane contributes the greatest proportion of noncarcinogenic risk at the site and UMR. The noncarcinogenic risk at the McIlvain well is far below any cause for concern.

The carcinogenic risk on-site, based on maximum concentrations found in 11 wells, is 3.6×10^{-2}. The present risk associated with untreated water at UMR is 2.28×10^{-4} (using maximum values) and 8.6×10^{-5} (using average values). The draft Risk Assessment attributes 82 and 88 percent, based on maximum and average concentrations, of the present risk in untreated water to site-related chemicals, although other sources may contribute to the contamination found at UMR. Also, analyses in the Risk Assessment of a potential worst-case release to the UMR predict a level of carcinogenic risk ranging from 1.23×10^{-3} to 2.57×10^{-4} for untreated water. The risk affiliated with potential carcinogens in the McIlvain well is 6.8×10^{-6}.

For the exposure scenarios modeled in the Risk Assessment, the highest HI for chemicals with noncarcinogenic effects is 386 (water at maximum concentrations on-site). The HI associated with untreated UMR water is considered low, ranging from 0.6 to 2.3. A potential worst-case release to the UMR from the site would produce a HI ranging from 2.9 to 13.7. The HI for the McIlvain well is calculated at 0.009.

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* Models 2 through 5, which simulate a dilution of site chemicals with 97 percent of the UMR recharge basin, dilute on-site concentrations 33 times (1.0 divided by 0.03).

The primary exposure route from the site is through drinking treated UMR water. MCLs presently are met in treated UMR water. The total risk from treated UMR water is 4.4×10^{-5} (using maximum concentrations) and 1.9×10^{-5} (using averages). The extent to which treatment at UMR would protect human health if UMR water-quality degrades further, such as modeled in Models 2 through 5 of the RI, has not been quantified.

In light of the substantial uncertainties associated with the characterization of contamination and ground water movement in the vicinity of the site and EPA's general standard for clean-up of Superfund sites to the 10^{-6} risk level, the potential for adverse health effects, based on carcinogenic risks, is considered substantial. "No action" is unacceptable and ground water cleanup to 10^{-6} risk or background levels is recommended.

VII. DOCUMENTATION OF SIGNIFICANT CHANGES

No significant changes were made to the selected alternative after the Proposed Plan.EPA recently released to the public the following three documents that further clarify the preferred remedy outlined in the Proposed Plan:

- Recommendations for Cleanup Criteria- Henderson Road Injection Well Operable Unit;
- Henderson Road Injection Well Site Final Report on Additional Work on Effluent Treatment Piloting and Other Remedial Measures;
- Recommendations for Pre-Design Investigations- Final Report for the Henderson Road Injection Well Operable Unit.

These documents are considered a logical outgrowth of information made available to the public. These were developed by EPA because EPA's preferred remedy differs from each of the alternatives listed in the FS. These documents were developed to clarify certain key components of EPA's preferred remedy and to facilitate negotiations with PRPs for RD/RA settlement.

VIII. DESCRIPTION OF THE ALTERNATIVES

A. Summary of Alternatives

The seven screened alternatives evaluated in the FS and EPA's preferred alternative, Alternative 7a, are summarized in the following table:

Option Alternative	Ground water Monitoring	Injection Well Closure	Institutional Controls	Treatment at McIlvain Well	In-situ Volatilization	On-site Pump & Treat	Down-gradient Pump & Treat
1	X						
2	X	X	X	X			
3	X	X	X	X	X		
4	X	X	X	X		X	
5	X	X	X	X		X	X
6	X	X	X	X	X	X	
7	X	X	X	X	X	X	X
7a	X (more extensive than alternative 7)	X	X	X	X (pending further works; other technologies also to be considered)	X	X (pending further work)

B. Treatment Components

The options comprising the above alternatives are described below.*

Monitoring- For all alternatives, three additional on-site and two or three additional downgradient well clusters are proposed in the FS for periodic ground water sampling. The 12 wells drilled and sampled for the RI plus the additional proposed wells would be sampled quarterly for the first year and analyzed for volatile organics, semi-volatile compounds and total metals. Six of the wells exhibiting the most elevated contaminant levels during the first year would be sampled on a quarterly basis for the duration of operation and maintenance.

Those alternatives which include ground water recovery would include the additional recovery wells in the ground water monitoring program.

The monitoring program comprising Alternative 7a is more extensive and refined than that proposed for Alternatives 1 through 7, for two reasons. Monitoring during well construction, operation and maintenance under Alternative 7a will be fundamental in determining whether to institute in-situ aeration or other unsaturated zone treatment at the site. Section VIII.D describes this proposed additional site monitoring and describes monitoring for pilot testing needed to select treatment technologies for ground water. Additional characterization of the unsaturated zone also is needed prior to selecting a treatment option for the unsaturated zone (including, possibly, no action) as part of EPA's preferred alternative. Secondly, EPA's opinion is that additional work is needed to characterize the saturated zone to most effectively design a ground water recovery program. Details of the monitoring program will be developed in Remedial Design.

Monitoring under Alternative 7a also will include monitoring at the Hubing well, which EPA considers to have been affected by "mounding" from the injection well, the McIlvain well, which may presently be affected by the Injection Well Operable Unit, and UMR.

Injection Well Closure- Injection well closure will involve excavation of the well cap and any contaminated sediments in the shallow vicinity of the injection well, backfilling of the adjacent oil pit, and permanently sealing the two discharge pipes leading into the pit and the floor entrance to the pit. This would remove a potential pathway for contaminated surface waters to enter the subsurface water to enter the subsurface zone.

*The PRPs proposed additional changes to their recommended alternative in a letter dated June 17, 1988 to EPA. These recommendations are not discussed in this ROD, except where the PRPs' recommendations are incorporated into EPA's selected remedy. The Responsiveness Summary addresses the June 17 letter.

Since the soils in the vicinity of the injection well and oil pit have never been sampled, the type and volume of material to be treated are unknown. Excavation of sediments in deep bedrock fractures is considered infeasible. The contaminated soil and sediments in the vicinity of the injection well pit and oil pit will be excavated and disposed at an approved landfill or, if prohibited by the Land Ban, incinerated or otherwise disposed appropriately.

Institutional Controls - Institutional controls may include:

- use restrictions, to be obtained by site owners or operators from owners of property affected by the injection well operable unit, prohibiting the construction of any water supply wells;
- periodic inspection by regulatory agencies to ensure that the injection well remains sealed;
- prohibition of ground water extraction, as a restrictive covenant, for the property comprising the site.

These controls are expected to mitigate the risk from exposure and potential exposure related to direct ingestion of ground water affected by the site until the aquifer restoration objective is achieved (see Section VIII.D on "aquifer restoration objective").

Treatment at McIlvain Well - The McIlvain well water supply would be treated at the point of use by an activated carbon system. The type of activated carbon system commonly used in household applications is expected to remove the volatile organic contaminants, which comprise the 6.75×10^{-6} risk for carcinogens at the McIlvain Well, to below the 1.0×10^{-6} risk level. Pilot testing is not anticipated to be needed for installation of this system. Carbon would continue to be replaced at the McIlvain well until aquifer restoration objectives are achieved.

One assumption related to this option is that the McIlvain well is the sole active well affected by the Henderson Road Site and used for drinking water purposes.

In-Situ Volatilization - In-situ volatilization (ISV) remediation would involve the use of extraction wells selectively located through the unsaturated fractures and voids in bedrock which would generate a vacuum in the subsurface. This vacuum would act to reduce the apparent boiling point of the volatile organics within the zone of influence in the subsurface, resulting in a greater proportion of the contaminant partitioning into the vapor phase. The exiting gas stream would be withdrawn through the extraction wells, and would carry these organics into a carbon adsorption system to control emissions into the atmosphere, if necessary.

Organic compound vapors in the unsaturated bedrock voids and fractures, and possibly some dissolved volatile organic compounds in the ground water, would be extracted with ISV. If volatile organic contamination in the unsaturated zone is a significant portion of the source of contamination, future ground water degradation could be reduced with ISV. Recovery of some acid extractable organics and base/neutral organics with some volatility from the unsaturated zone may be achieved. However, ISV would have no effect on phthalate wastes in the unsaturated zone.

The estimated reduction of volatile organic compound waste in the unsaturated zone ranges from 90 to 99 percent. Although this option is not expected to reduce the mobility of any phthalates, which are not volatile, phthalates are considered to be immobile. The volume of waste that would be treated is unknown because the extent of volatile organic compound contamination in the unsaturated zone has not been determined. See Section VIII.D.

A pilot study would be required to determine whether the ISV system could remove contamination effectively from the unsaturated zone, and, if so, to refine the operating parameter for the ISV system. A pilot study would provide the basis for evaluating organic removal efficiency from the subsurface zone in the vacuum stream, the removal efficiency of the GAC offgas treatment system, and the potential effects of shortcircuiting of the withdrawal system (i.e., the characteristics of the fractures in which a vacuum would be created for ISV, along with other factors, may limit the ability to effectively establish a vacuum in certain parts of the area being treated).

Criteria to discontinue the vacuum extraction process are discussed in Section VIII.D.

In-situ volatilization is a relatively new technology and application of this technology in fractured formations is very limited. Because of this, and because the extent of contamination in the unsaturated zone is not fully characterized to date, ISV is not considered highly reliable without conducting a pilot study.

On-site Pump and Treat - Three to five 8-inch recovery wells are proposed in the FS to be installed on-site and pumped to remediate on-site ground water at about 400 foot depths. If necessary to ensure ground water containment, additional on-site recovery wells would be installed. Treatment is proposed to include a sedimentation/precipitation basin to remove elevated concentrations of zinc and some organic compounds, and an air stipper, to remove elevated concentrations of volatile organics. Vapor phase carbon adsorption, if needed to control air emissions, would be added to the treatment train. A biological treatment system also is proposed if pre-design treatability studies indicate additional ground water treatment would be needed to meet performance criteria ARARs. The air stripper effluent is likely to be discharged to the intermittent stream along the eastern portion of the site. One other discharge option is injection of part of the effluent to the aquifer in the vicinity table of the injection well.

A brief pump test on-site has shown that sufficient draw-down of ground water at the site could be achieved in order to induce the contaminants in the surrounding area to flow into one well. However, due to the uncertainties of ground water flow in fractured bedrock, the well field that would be established may not be capable of capturing all of the contaminated water on-site at a reasonable pump rate. Certain field activities are recommended as part of Alternative 7a to improve prospects for capturing contaminants in the ground water. See Section VIII.E.

Air stripping technology is based on the principle of vapor-liquid equilibrium. Contaminated water is contacted with large volumes of ambient air. The concentration of contaminants in the influent air is far below equilibrium, providing the driving force for transfer of contaminants from water to air. Contaminated water is pumped from the water source to the tower, where it is countercurrently contacted with air. The water entering the tower trickles down over a packed media which generates a thin film of water for air contact. The thin film provides a large surface area for air to water contact. Packed column aeration has been demonstrated to provide a cost-effective system for removing volatile organics from the ground water.

Exhibit 14 outlines possible treatment processes to be used on ground water pumped at the site. Additional treatment could include pH adjustment, granular activated carbon, PACT activated sludge process, and filtration.

Prior to piloting full scale design, on-and off-site wells will be sampled and analyzed for the following parameter

- BOD_5
- COD
- Ammonia -N
- Phosphates
- pH
- TSS
- TS
- TDS
- oil and grease
- alkalinity
- hardness.

Based on results from this sampling and design criteria listed in Exhibit 15, the required pilot processes can be determined and certain technologies may be screened out.

Pump and treat is expected to achieve a slow but steady reduction of the amount of soluble contaminants at the site. However, in addition to the uncertainties and limitations described above, the rate that the soluble remnant waste infiltrates the aquifer is unknown. This data gap increases the uncertainty related to the potential for on-site pumping to achieve aquifer restoration. Finally, the potential to restore the downgradient portion of the aquifer is limited with only on-site pumping performance criteria ARARs.

The phthalates typically exhibit limited amenability to air stripping. However, it is anticipated that the technologies selected through the pilot testing outlined in Exhibit 14 should achieve performance criteria ARARs.

Off-Site Pump and Treat - As described in the FS, off-site ground water pumping and treatment would involve installation of approximately three downgradient recovery wells, in addition to the on-site recovery wells described above*, from which water would be treated through air stripping. Effluent from the stripping tower would be discharged either to the adjacent intermittent stream or reinjected to the aquifer. Section VIII.E describes field activities recommended as part of Alternative 7a to improve prospects for capturing ground water contaminants.

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*Off-site pumping is not being considered as an option without on-site pumping; consequently, treatment components of off-site pumping are only described here as part of an on- and off-site pumping program.

Depending on the yields obtained from on- and off-site pumping and the location of contaminants in the ground water, off-site pumping in addition to on-site pumping is expected to improve prospects for capturing on-site and downgradient contaminants. In the FS, primary treatment levels for off-site pumping are addressed as an additional level of protection to on-site pumping i.e., in the FS, downgradient contamination is expected to be less severe than on-site contamination, so pumping downgradient is considered to be less effective in remediating the aquifer. In Alternative 7a proposed by EPA, off-site treatment would be implemented only if off-site treatment would achieve a similar order of magnitude reduction as on-site treatment i.e., if downgradient pumping would be just as effective as recovering contamination as on-site pumping, downgradient recovery would be implemented.

In the FS, the downgradient treatment system is described as expected to be less complex than the on-site treatment systems, based on relatively low levels of contaminants expected in the FS to be detected downgradient. The system is proposed to include a sedimentation/precipitation basin to remove metals and a smaller packed tower than the on-site air stripper(s) to remove volatile organics. Emissions controls are determined in the FS to be unnecessary (on a preliminary basis), because PA Air Toxic Guidelines are expected to be met. In Alternative 7a proposed by EPA, downgradient pumping is proposed only if criteria for siting downgradient wells described above are met. Thus, under Alternative 7a, relatively high concentrations of contaminants would be found downgradient in order for downgradient recovery wells to be operated. If contamination downgradient is just as high as on-site than a similar treatment system would be needed under Alternative 7a for ground water pumped from downgradient and on-site.

The sampling program and design criteria described above for on-site pump and treat would be applicable for off-site pump and treat pilot testing and technology screening as well. Should additional treatment be needed to address less volatile contaminants, the technologies listed in Exhibit 14 would be considered.

As with on-site pump and treat, clean-up goals for off-site pump and treat as part of Alternative 7a are MCLs, other ARARs, or background levels, depending on the chemical of concern. See Section VIII.D.

C. Implementation Timeframes

The estimated remedial action timeframes for each of the alternatives are summarized below:

Alternative	Estimated Time to Achieve Aquifer Restoration (excluding background contaminants)	Comments
1	NA	Not expected to achieve aquifer restoration. Costs based on 30 years O&M.
2	NA	Not expected to achieve aquifer restoration. FS costs based on 30 years O&M.
3	Unknown	Extent of wastes in unsaturated zone is unkown, so cannot predict extent to which ISV would accelerate cleanup or whether aquifer restoration would be achieved without pilot test. Assumed 2-4 years of ISV O&M in Terra Vac estimate in FS. Without ground water pumping, minimal reduction in toxicity, mobility and volume of existing contaminated ground water is expected.
4	> 30 years;	Will achieve reduction in toxicity, mobility and volume, but unknown whether aquifer restoration could be achieved.
5	≥ 30 years; possibly less than Alternative 4	Will achieve reduction in toxicity, mobility and volume but unknown whether aquifer restoration objective could be achieved. More likely to achieve aquifer restoration than Alternative 4.

6	≥ 30 years; less than Alternative 4	Cannot predict extent to which ISV would accelerate cleanup. Will achieve reduction in toxicity, mobility and volume. More likely to achieve aquifer restoration than Alternative 4 and 5, but still unknown.
7	≥ 30 years; less than Alternatives 5 and 6	Cannot predict extent to which ISV would accelerate cleanup without piloting. Will achieve reduction in toxicity, mobility and volume. More likely to achieve aquifer restoration than Alternatives through 6 and possibly 7, but still unknown.
7a	≥ 30 years; less than Alternatives 5 and 6; possibly less than Alternative 7.	Cannot predict extent to which ISV would accelerate cleanup without piloting. Will achieve reduction in toxicity, mobility and volume. More likely to achieve aquifer restoration than Alternatives 1 through 6 and possibly 7, but still unknown.

D. Description of Major ARARS for Selected Remedy

Remedial Objectives - In the FS, two different clean-up goals are proposed for Alternatives 4 through 7. Under the first Alternative, the ground water recovery and treatment system would operate in an attempt to clean the ground water beneath the site property line to drinking water standards ("aquifer restoration"). Thirty years of O&M are estimated for cost purposes. Under the second Alternative, remediation would occur only until contamination at the site is reduced to a point where, once diluted with the UMR recharge basin (a three percent contribution from the site to the recharge basin is used for the model), drinking water standards are achieved at UMR. Both scenarios are based on an assumption that no other sources contribute or will contribute to contamination at UMR.

EPA has selected aquifer restoration as the clean-up goal for the site because data uncertainties and complexities related to the movement of wastes through the aquifer make predictions difficult regarding potential off-site release which would pose a risk to human health and the environment. Under Section 121(d)(2)(B)(ii) of SARA, alternate concentration limits may not be applied at the property line if human exposure may occur beyond the boundary of the facility unless:

(I) there are known and projected points of entry of ground water into surface water,
(II) on the basis of measurements or projections, there is or will be no statistically significant increase of constituents from ground water in surface water at the point of entry or at any point where there is reason to believe accumulation of constituents may occur downstream; and
(III) the remedial action includes enforceable measures that will preclude human exposure at any point between the facility boundary and all known or projected points of entry of ground water into surface water.

EPA is not prepared to conclude that the existing measurements or projections establish that there is or will be no statistically significant increase of constituents as described in (II) above.

Clean-up Criteria (ARARs) for Capping and Plugging the Injection Well

The injection well currently is listed in the EPA Underground Injection Well Control Program. Closure of the well, including capping the well, will conform with applicable EPA injection well closure standards (40 C.F.R. Part 144.28).

Clean-up Criteria (ARARs) for Ground Water Pumping - Exhibit 16 lists cleanup criteria (ARARs) proposed for chemicals of concern that will be treated and monitored. As shown in Exhibit 16, these ARARs are based on the most conservative value derived from the following: MCLs, MCLgs, aquatic water quality criteria, drinking water equivalent levels, Suggested No Adverse Effect levels, models developed during the Risk Assessment, processes described in the Superfund Public Health Evaluation Manual, and specific values accepted by EPA (where no other ARARs exist). Consistent with EPA Interim ARAR Guidance dated July 14, 1987, MCLs, where available, were used.

These are based on identifying the aquifer of concern as equivalent to a Class IIA aquifer, a current source of drinking water. Also, five chemicals that are considered regional contaminants (1,1-dichloroethane, 1,2-dichloroethane, benzene, trichloroethene and 1,2-dichlorpropane are proposed to be remediated to the most conservative value of the following three criteria:

- Average concentrations of the compounds in the Estock, Hubing, and HR-1 averages will be modified as additional background wells are developed;
- Average concentrations of the compounds in wells on-site (excluding HR-2-195, HR-4-195, HR-4-295, HR-5-192, and HR cluster 1);
- Proposed chemical-specific ARARs for a Class IIA aquifer (Exhibit 16) multiplied by a dilution factor of 33 as discussed in the FS.

ARAPs proposed in Exhibit 16 are based on the assumption that regional ground water contamination will not change in the future. Should background contamination increase based on sampling results from the above well plus new wells to be installed, the target criteria for regional contaminants could be changed, using the same criteria listed above, with averages recalculated with new values.

Clean-up criteria would be applied to ground water quality monitored at both the recovery and monitoring wells. The operation of the ground water recovery and treatment system may be discontinued when the upper limit of the mean concentration of each indicator parameter (from the five most contaminated monitoring and/or recovery wells associated with the ground water treatment and recovery system as defined by each period of sampling or other basis to be determined in Remedial Design) is less that the appropriate clean-up criteria. A statistical tool, such as the Student's T test, would be used to define the upper range within which the mean concentration of a representative sample would occur. The upper limit of the sample mean must be below the specified clean-up criteria for four consecutive quarterly monitoring events before the treatment system would be discontinued. This will ensure that seasonal fluctuations in site conditions are accounted for in the evaluation. If all parameters meet these criteria, except for those that have been identified as regional contaminants (as specified above), the criteria may be waived for these compounds if sufficient information determines that regional influences are responsible for the observed levels of contaminants above the specified criteria. The pump-and-treat system would be reactivated if the concentration of the indicator parameters shows a statistically significant increase above the cleanup criteria in two consecutive quarters.

Individual ground water extraction wells may be removed from the ground water recovery and treatment system independent of full system shutdown. If ground water contaminant levels from an individual extraction well are below the clean-up criteria for four consecutive quarters, then the well may be taken off-line. Monitoring of off-line wells should continue on a quarterly basis. The reaction of ground water quality at other wells, from the shutdown of individual extraction wells, also would be observed to ensure that the effectiveness of the ground water recovery and treatment system is maintained. The well would be reactivated as a recovery well if the concentration of the indicator parameters during the quarterly monitoring exceeds the clean-up criteria for two consecutive quarters. Again, requirements for recovery well or system shut down for those parmeters that are regional contaminants may be waived if sufficient information determines that regional influences are responsible for the observed contaminant concentrations.

Clean-up Criteria (ARARs) for Injection Well Sediment Excavation - If soils in the vicinity of the injection well and oil pit are shown to have the potential to cause future ground water contamination above health-based goals, they will be removed to a feasible, cost-effective depth. EPA plans to excavate shallow soils and sediments that do not meet RCRA standards for ignitability, corrosivity, reactivity or toxicity and those that fail the TCLP test. In addition, the TCLP will be used to determine the degree of excavation required around the injection well pit and oil pit.

Clean-up Criteria for ISV- The proposed alternative includes ISV as one potential technology to be implemented should remediation of the unsaturated zone prove necessary. On a preliminary basis, criteria to discontinue the vacuum extraction process is proposed at 400 ppb total volatile organics in the offgas when averaged over a three-month period. At 400 ppb, the system is expected to experience diminishing returns in terms of reduction in concentration and reduction in contaminant removal. Refinement of criteria for discontinuance of an ISV system would be needed through a pilot study.

Since a treatment process has not been selected for the unsaturated zone for this ROD (ISV was only proposed as one option and evaluated, for costing-purposes, on a preliminary basis), clean-up criteria for other potential unsaturated zone treatment processes (e.g., unsaturated zone flushing) have not been developed.

Performance Criteria (ARARs) for Ground Water Treatment - Indicator parameters for assessing the performance of the ground water treatment system are based on the following criteria:

- Risk: Any compounds that hypothetically could impact UMR (based on Model 1 of the RI) with a carcinogenic risk greater than 1×10^{-6} or a non-carcinogenic hazard index risk greater than 0.5;
- Magnitude of maximum concentration in relation to the proposed cleanup criteria: Any compound that exceeds the aquifer restoration criteria;
- Treatment process specific compounds: Compounds that are treated by each of the ground water treatment processes.

For discharge of the treated effluent to the dry swale along the eastern portion of the site, compliance with NPDES discharge permit requirements which include the PA toxic strategy must be attained. It is likely that the proposed effluent standards will be acceptable for surface discharge. PA DER may require that discharge at the property boundary will not adversely impact water quality and aquatic life at the point where it discharges into the point of continuous flow and that treatment to the 10^{-5} or 10^{-6} cancer risk level must be achieved. The Delaware River Basin Commission and PA DER will be contacted for review and guidance on specific effluent requirements.

If part of the treated water is discharged back to the ground water through an infiltration gallery to "flush" the unsaturated zone, the treated effluent must meet drinking water standards or human health criteria, whichever is more stringent.

Performance Criteria (ARARs) for Air Emissions- Exhibit 17 lists air quality guidelines that would apply to air emissions from air strippers or any other treatment options implemented at the site. The emissions of all toxic air contaminants listed in Exhibit 17 must meet the requirements of Pennsylvania air toxic guidelines entitled, "Interim Operating Guidance for Air Toxic Substances: New and Modified Sources," dated September 27, 1985. This guidance establishes rules for determining the concentrations of toxic air contaminants from a source measured at the property line (or at any point off the property) and establishes limits for the concentrations of toxic air pollutants.

The following conditions must be met for the emissions of any toxic air pollutant:

- When the maximum ambient concentration of any toxic air contaminant is within a factor of three below the air quality guidelines, every effort should be made to reduce the concentration by improvements in air pollutant release characteristics, reductions in operating schedule, and other factors that may reduce the maximum ambient concentration;
- When the maximum ambient concentration of any toxic air contaminant is within a factor of three greater than the air quality guidelines, consideration should be given to reducing the amount of toxic substance that would be emitted by improving the air pollution control equipment or procedures;
- When the maximum ambient concentration of any toxic air contaminant is within a factor of three greater than the air quality guidelines and cannot be reduced to substantially less than the air quality guidelines, the PA DER Air Toxic Coordinator must approve or disapprove the construction of the source;
- If the maximum ambient concentration of any toxic air contaminant is substantially greater than the air quality guidelines, the emission of the air toxic substance must prevent an unacceptable risk to public health.

Furthermore, if VOC emissions are determined to jeopardize the attainment of the ozone standard, emission controls must be implemented in order to reduce VOC emissions to an acceptable level. This determination is made by the PA DER on a case-by-case basis after submittal of plans to PA DER.

The emissions of toxic air contaminants and volatile organic compounds to the atmosphere can be controlled to the extent necessary in order to achieve these requirements by using gas vapor phase activated carbon.

Performance Criteria (ARARs) for Off-site Disposal- Off-site disposal of hazardous waste must be performed in accordance with the requirements of the EPA's Off-site Policy, which prohibits the use of a facility that has significant outstanding Class I violations under RCRA. The materials that are expected to be disposed off-site would be soil or sludge excavated from the base of the injection well pit, cuttings from the drilling of wells, and contaminated equipment or garb used by workers. (Spent activated carbon from remedial treatment systems would be reclaimed and reused at a recycling facility). The contaminated materials are likely to be sent to a hazardous waste incinerator or other appropriate disposal facility, as RCRA Land Disposal Restrictions

("Land Ban") are likely to be applicable or relevant and appropriate for these materials.

E. Description of the Preferred Alternative

EPA's preferred alternative is Alternative 7a. This differs from the alternative recommended by the PRP Respondents in the RI/FS, which is Alternative 4. Indeed, while certain components of EPA's alternative are similar to those comprising the alternatives evaluated in the RI/FS, EPA's preferred alternative differs from all seven alternatives analyzed in the RI/FS. This is because EPA determined that an additional alternative or alternatives were needed to address the high level of uncertainty pertaining to the characterization, fate, and transport of contaminants related to this site. EPA also disagrees with the recommendation, in the RI/FS, to select UMR restoration as a clean-up goal.

As various drafts of the RI/FS were developed, EPA commented that significant uncertainty still existed regarding the vertical and lateral extent of contamination in the unsaturated and saturated zones. EPA determined that data gathered to date was sufficient to screen and evaluate FS alternatives and begin Remedial Design/Remedial Action. However, EPA expected that additional characterization would be necessary in order to design a treatment system. Since none of the alternatives proposed in the FS addresses this need,* EPA prepared a report entitled, "Draft Pre-Design Recommendations for the Henderson Road Injection Well Operable Unit", the major components of which are incorporated into the EPA preferred alternative.

EPA's preferred alternative is comprised of the following:

- injection well investigation, possible remediation, and closure;
- on-site ground water investigation, pumping and treating with air stripper and other treatment technologies, if necessary to meet effluent and emission performance criteria;
- downgradient ground water pumping and treatment, depending on further analyses of downgradient ground water hydraulics and contamination;
- installation, operation and maintenance of a carbon absorption water treatment system at the McIlvain well;

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* The PRP Respondents disagree with EPA that additional characterization is needed. See Responsiveness Summary.

SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

NOTE: Alternatives presented are those which have aquifer restoration modified to address regional background contamination, as their objective

ALTERNATIVE	PROTECTIVENESS	COMPLIANCE WITH ARARs	LONG-TERM EFFECTIVENESS	REDUCTION OF TOXICITY MOBILITY AND VOLUME	SHORT-TERM EFFECTIVENESS	IMPLEMENTABILITY	P. W. COST ($1000)	STATE/COMMUNITY ACCEPTANCE
1. No Action, Monitoring.	Would not provide protection for any potential receptor.	Would not meet ARARs either on or off-site.	Risk to potential receptors remains, both on and off-site.	Does not reduce toxicity mobility or volume.	Short term risks would be to workers both at the site and installing monitoring wells.	Easily implemented.	1,450	Acceptability should be low.
2. Injection Well Closure, Institutional Controls McIlvain Treatment or Alternative Water Supply and Monitoring.	Would protect on-site workers from contract with contamination and remove source materials. Offsite receptors would be protected, but UMR would not.	Would not meet ARARs in the aquifer.	Risks would be reduced at McIlvain Well and other potential aquifer users. Risk at UMR would remain.	Reduction of source volume in on site soils.	Minor increase in exposure during construction. Low short term risk.	Easily implemented.	1,511	Acceptability should be low.
3. Injection Well Closure, Institutional Controls, McIlvain Treatment or Alternative Water Supply, In Situ Volatilization, and Monitoring.	Protects on-site workers and McIlvain employees. Volatilization would reduce some contamination if effective.	Would not meet ARARs in the aquifer.	Removing some source material would reduce some risk, However risk at UMR would remain.	Reduction of source soil volume and limited reduction in ground water volume and toxicity.	Minor increase in exposure during construction. Low short term risk.	Due to complex geology in-situ volatilization may have limited implementability.	6,381	Acceptability should be low.
4. Injection Well Closure, Institutional Controls, McIlvain Treatment or Alternative Water Supply, On-Site pump and Treat and Monitoring.	Would protect workers onsite and receptors offsite. Is also protective of UMR while restoring the aquifer.	Has the potential to meet aquifer restoration ARARs on-site and limited potential to meet aquifer restoration ARARs off-site.	Removing some source material and treating on-site contaminated ground water to the lowest levels would significantly reduce the risk.	Would reduce volume and mobility of soil and the ground water contamination on site and would subsequently reduce volume off site. Does not reduce all source volume.	Minor increase in exposure during construction. Low short term risk.	Easily implementable. Uses proven technologies. Aquifer restoration may not be achievable.	6,478	Should be moderately acceptable, due to potential to offer some aquifer cleanup. Some PSAC objections are expected.*
5. Injection Well Closure, Institutional Controls, McIlvain Treatment or Alternative Water Supply, On-Site and Downgradient Pump and Treat and Monitoring.	Would protect workers onsite and protect receptor offsite including the UMR while restoring the aquifer.	Has the potential to meet aquifer restoration ARARs both on and off-site.	Removing some source material and treating on and off-site contaminated ground water to the lowest levels would significantly reduce the risk.	Reduces volume and mobility of contamination in soil the on-site and ground water both on and off-site.	Minor increases in exposure during construction. Low short term risk.	Easily implementable. Uses proven technologies. Aquifer restoration may not be achievable.	6,071 to 6,765	Should be moderately acceptable, due to potential to offer some aquifer cleanup. Some PSAC objections are expected.*
6. Injection Well Closure, Institutional Controls, McIlvain Treatment or Alternative Water Supply, On-Site Pump and Treat, In-Situ Volatilization, and Monitoring.	Highly protective of on-site and off-site receptors including the UMR while restoring the aquifer.	Has the potential to meet aquifer restoration ARARs both on and off-site.	Removing most source material and treating on-site contaminated ground water to the lowest levels would greatly reduce the risk.	Reduces volume and mobility of source materials and reduces mobility and volume of on-site and subsequently off-site ground water.	Minor increases in exposure during construction. Low short term risk.	Implementable, except for in-situ volatilization which may not be effective. Aquifer restoration may not be achievable.	9,328	Should have high level of acceptance due to potential to achieve source and aquifer cleanup. PSAC objections would still exist.*
7. Injection Well Closure, Institutional Controls, McIlvain Treatment or Alternative Water Supply, On-Site and Downgradient Pump and Treat, In-situ Volatilization and Monitoring.	In-situ volatilization offers protection both on and off-site by removing all source materials. Pump and treat is highly protective of on and off-site receptors while restoring the aquifer.	Has greater potential to meet aquifer restoration ARARs both on and off-site than previous alternatives, but lower potential than 7A.	Offers greater risk reduction than previous alternatives, but lower than 7A, by removing most source material and restoring the aquifer.	In-situ volatilization offers in mobility and volume of contamination in on and off-site soil. Reduces volume and mobility of contaminations in ground water both, on and off-site.	Minor increases in exposure during construction. Low short term risk.	Implementable, except for in-situ volatilization which may not be effective. Aquifer restoration may not be achievable.	10,921	Should have high level of acceptance. Aquifer and source cleanup objectives would promote acceptance. PSAC objections would still exist.*
7A. Injection Well Closure, Institutional Controls, McIlvain Treatment or Alternative Water Supply, On-Site and Downgradient Pump and Treat, In-situ Volatilization, Monitoring and Additional Characterization.	Offers potentially, the highest level of protection from contamination both on and off-site by strategically locating recovery wells in order to remove source materials.	Has greatest potential to meet aquifer restoration ARARs both on and off site.	Removing most source material and treating on and off-site contaminated ground water may offer greatest risk reduction.	Reduces volume and mobility of soil and ground water contamination both on and off-site.	Minor increases in exposure during construction. Low short term risk.	Implementable, except for in-situ volatilization which may not be effective, However piloting will identify potential implementability problems.	5,551 to 12,222	Should have highest level of acceptance. Aquifer and source cleanup objectives would promote acceptance. PSAC objections would still exist.*

* PSAC has commented that reimbursement of previous design and construction costs associated with air stripper installation should be included in the selected remedy.

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- on-site, upgradient and downgradient ground water monitoring (including at the Hubing and McIlvain wells and UMR) throughout design, operation and maintenance of the ground water treatment system and for the period following discontinuation of pumping;
- periodic evaluation of the progress of the treatment system in achieving ARARs and, if appropriate, reevaluation of the aquifer restoration objective and ARARs, considering feasibility and cost-effectiveness;
- further investigation of the unsaturated zone prior to determining whether direct unsaturated zone treatment should be instituted and, if so, selecting an appropriate technology. In-situ volatilization* and soil flushing are two treatment technologies under consideration. Other technologies could be selected instead or a decision may be made to forego direct remediation of the unsaturated zone; and
- institutional controls to restrict or limit the use of ground water on properties affected by the injection well operable unit.

Exhibit 18 shows how the investigative activities proposed as part of EPA's preferred alternative will factor into revising the current conceptual model of the site (i.e., the extent/nature of contamination, fate and transport, existing and potential risk, and costs of potential remediation). Exhibits 19 through 21 outline, in more detail, the progress of events for the injection well, unsaturated zone, and saturated zone investigations. Section VIII.B briefly describes the pilot testing and criteria that will determine final ground water treatment design.

Estimated costs for EPA's preferred alternative range from $ 5.5 million (if no ISV or other unsaturated zone treatment is instituted and no downgradient & pumping) to 12.2 million (if ISV is instituted). Exhibit 22 provides documentation of these costs.

IX. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A Summary of the comparative analysis of alternatives is provided on the following table. Costs included in the table are estimates only.

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* ISV is used as a basis for determining the costs of the unsaturated zone component of the preferred alternative.

X. THE SELECTED REMEDY

EPA has selected Alternative 7a based on consideration of the following:

- the comparative analyses of alternatives described in Section IX;
- particular emphasis on overall protection of human health and the environment and compliance with ARARs, in light of the uncertainty related to a potential off-site release;
- the overall implementability of each alternative; i.e., further characterization is included in the preferred remedy to improve prospects for achieving aquifer restoration. Periodic evaluation of progress in achieving clean-up goals is included in order to address the current uncertainty regarding the effectiveness of proposed unsaturated and saturated zone remediation.

A. Risk Level to be Attained

If the aquifer restoration objective, modified to address regional contamination, is attained, on-site clean-up will be achieved to the levels specified in Exhibit 16 or other levels to be established based on additional well installation and future on- and off-site monitoring. The ARARs proposed in Exhibit 16 will result in carcinogenic risk levels for on-site ground water of approximately 7 x 10^{-4}. Since the current on-site carcinogenic risk is calculated at 3.6 x 10^{-2}, the risk reduction effected by successful implementation of EPA's selected remedy would be about 50-fold. A risk level of 7 x 10^{-4} is within the range of risk of 10^{-4} to 10^{-7}, which is generally considered "acceptable" by EPA. However, complete aquifer restoration is not considered feasible because of background contamination. Should background contamination increase or decrease the risk level would change too.

Ground water quality and the risk associated with the respective contaminants found in the 11 on-site wells is substantially different from UMR water quality. This is not unexpected, since the site has been estimated to contribute only a small percentage of the total recharge to UMR. Because of this relatively small ground water contribution from the site, most changes in loading from the site are expected to have minimal impact on UMR.*

The Risk Assessment attributes 44 and 33 percent (based on maximum and average concentrations used in models 10 through 13) of the risk in treated UMR water to chemicals detected at the site. The total risk from treated UMR water has been calculated at 4.4×10^{-5} (using maximum concentrations) and 1.9×10^{-5} (using averages). Thus, if all the risk from Henderson Road-related chemicals were eliminated, risk from drinking treated water at UMR would be reduced to 1.9×10^{-5} and 4.3×10^{-6}. This assumes the site is the sole contributor of all concentrations of chemicals found at both UMR and the site. Also, this is not viewed as a significant risk reduction.

However, under a worst case hypothetical scenario for a potential release from the site to UMR, maximum concentrations at the site would be diluted en route to UMR and added to the existing maximum untreated water concentrations at UMR. Risk associated with this scenario have been calculated at 1.3×10^{-3} (model 3). Treatment at UMR would be expected to reduce this risk. While the assumptions used in this model may be conservative, the uncertainties associated with the site, as described earlier, warrant an approach most protective of human health. Clean-up to MCLs, or other ARARs modified to address background contamination, would reduce prospects for a release such as calculated in model 3 of the Risk Assessment.

The following premises are factored into the goal of achieving an on-site risk of 7×10^{-4} through aquifer restoration:

- recovery wells will be situated, vertically and laterally, in major fractures so that on-site ground water contamination will be fully contained;
- recovery wells will be situated, vertically and laterally, in major fractures so that any site-related downgradient contamination of magnitude similar to on-site contamination will be significantly contained;

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* Certain hazardous substances, when released even in minute quantities, can have substantial impacts on an aquifer due to their high toxicity.

- ground water pumping will not result in significantly increased on-site contamination from regional contaminants being pumped to beneath the site at higher levels than currently detected in the "background" wells (see Section VIII.D);

- if unsaturated zone treatment is elected, such treatment will remove unsaturated zone contamination to the extent that an otherwise potentially significant, long-term release to the ground water is removed;

- nonaqueous phase liquids posing substantial risk will be removed through injection well closure and ground water pumping;

- any other conditions are not occurring or will not occur that will preclude achievement of aquifer restoration in a cost-effective fashion, such as a leveling-off of ground water quality levels at concentrations above proposed ARARs.

Because the nature, extent and location of hazardous substances disposed into the aquifer is uncertain, because background contamination may change in the future, and because the remediation implementation timeframe may exceed 30 years, EPA proposes conducting a formal evaluation of the clean-up goals and progress in achieving those goals every five years, from the commencement of ground water pumping (See Section VIII.E). Depending on the outcome of those five-year evaluations risk levels to be attained may change.

B. Rationale For EPA's Selection Of Its Preferred Alternative

- Additional characterization of potential ground water flow paths, depth of ground water contamination, background and downgradient ground water quality, and aquifer hydraulics is needed in order to improve prospects for siting recovery wells at key locations for successfully containing on- and off-site contamination and designing an appropriate ground water treatment system;

- Injection well investigation and closure is necessary to further characterize the type and extent of contamination, possibly remove potentially extensive contamination still in the immediate vicinity of the injection well, and remove any potential sources of new contamination.

- Ground water pumping is needed on-site to contain on-site contaminated ground water;

- Ground water pumping would be needed downgradient if a significant amount of contamination (i.e., magnitude comparable to on-site contamination) is detected downgradient and may be cost-effectively recovered (i.e. if prospects for achieving ARARs are expected to be high, based on yields).

- Characterization of unsaturated zone contamination is needed to determine the nature and extent of remnant waste in the unsaturated zone and help determine the implementebility, impact on human health, and cost-effectiveness of instituting ISV or other unsaturated zone treatment.

- Unsaturated zone treatment may be needed to address the criteria for long-and short-term effectiveness; i.e., if substantial amounts of hazardous substances pose a long-term threat of release from unsaturated zone to the ground water, unsaturated zone treatment would be appropriate.

- Treatment at the McIlvain well is needed to mitigate the existing and potential carcinogenic risk associated with that well.

- Ground water monitoring is needed to continually assess the performance of the remedial program and respond to changes as needed, e.g., EPA may decide to implement unsaturated zone treatment after observing ground water monitoring results for several years and determining that a substantial, continual release from the unsaturated zone is probably occurring.

- Monitoring of the McIlvain and Hubing wells and UMR will identify any increased risks that would need to be addressed. Monitoring at McIlvain is needed to identify when treatment may be discontinued.

- Hazardous substances are expected to remain on-site for at least several years after remediation has begun. Section 121(c) of SARA requires review of remedial actions, no less often than every five years after initiation of remediation, for those remedial actions that result in any hazardous substances remaining at the site. If, upon such review, EPA determines that action is appropriate in accordance with Section 104 or 106, such action should be required. In addition to possibly determining that unsaturated zone treatment, if not previously implemented, is needed during one of the five-year reviews for the Henderson Road Site Injection Well Operable Unit, other modifications to the remedial program may be selected. Alternatively EPA may determine, based on additional data, that:

- a potential off-site release is not expected;
- background contamination is changing such that clean-up goals need to be redefined for regional contaminants; or
- aquifer restoration, modified to address background contamination, is not likely to be achieved.

EPA then may reevaluate clean-up objectives and their affliated ARARs.

The Selected Remedy will allow injection well, ground water, and McIlvain wll remediation to commence, yet prescribes a conservative, cost-effective, and flexible approach to addressing the complexities related to this operable unit.

C. Points of Compliance

Section 121(d) of SARA directs the point of compliance to be at the property line. However, on-site recovery wells will be located at strategic locations for containing on-site contamination. Off-site recovery wells, if developed, will be sited where significant downgradient contamination may be contained. Monitoring wells will be sited to observe the effects of ground water pumping and most effectively characterize ground water flow and quality. These locations may not coincide with the property line.

Clean-up criteria for ground water pumping, sediment excavation, and ISV (on a preliminary basis only), as described in Section VIII.D, are based achieving ARARs in ground water beneath the site. This may result in remediation of ground water to levels below ARARs at the property line, but, unless ARARs change through the periodic evaluation that is part of Alternative 7a, will not result in exceedence of ARARs at the property line.

XI. THE STATUTORY DETERMINATIONS

A. Protection of Human Health and the Environment

The treatment prescribed in the selected remedy is designed to achieve an on-site risk, affiliated with the injection well operable unit, of approximately 7×10^{-4}. The existing on-site risk, based on maximum concentrations, is 3.6×10^{-2}. A 50-fold risk reduction for ground water beneath the site is expected with successful implementation of the selected remedy. This, in turn, is expected to reduce the downgradient risk from a potential significant off-site release.

If no significant future off-site release occurs, treatment at UMR is expected to continue to achieve a carcinogenic risk of 4.4×10^{-5} (based on maximum values) and 1.8×10^{-5} (based on average values). Treatment at the McIlvain well is expected to reduce the carcinogenic risk to below 1.0×10^{-6}.

Treatment at UMR is expected to continue to achieve a HI of 1.5 (based on maximum values) and .71 (based on average values). The HI for untreated McIlvain well water is .009; treatment may reduce this low HI even further.

No unacceptable short-term risks or cross-media impacts are expected from implementation of EPA's preferred remedy. Air pollution controls will be implemented, if needed, to meet State air emissions requirements and to address PSWC concerns regarding the effect of new air strippers on their existing treatment system.

B. Attainment of ARARs

With the exception of five background contaminants, the selected remedy will attain the ARARs of a Class IIA aquifer. ARARs and the rationale for their selection are listed on Exhibit 16. ACLs are proposed for 1,1-dichloroethane, 1,2-dichloroethane, benzene, 1,2-dichloropropane, and trichloroethene, as described in Section VIII.D. The process that has been and and will continue to be used to select ACLs is generally consistent with Section 264.94 of RCRA regulations and 1987 ACL Interim Final Guidance. Additional data on background contamination gathered during RD/RA (e.g., data from new background monitoring wells) will be incorporated into the evaluation of ARARs that is planned for every five years throughout operation and maintenance.

Other factors that will be considered in the five-year evaluations will include implementability (i.e. is ground water quality improving at an acceptable rate during remediation) and cost-effectiveness (i.e. is unsaturated zone treatment a cost-effective option to supplement ground water pumping).

Section VIII.D refers to RCRA "land ban" and off-site disposal requirements, NPDES permitting requirements, Injection Well Program requirements and state air pollution emissions requirements. Ground water withdrawals exceeding 10,000 gpd and surface and ground water discharges exceeding 50,000 gpd will require a permit from the Delaware River Basin Commission.

C. Cost Effectiveness

The selected remedy, with estimated costs ranging from $ 7.2 million to $ 12.2 million, affords overall effectiveness proportional to its costs such that the remedy represents a reasonable value for the money. Exhibit 22 compares estimated costs affiliated with each component of Alternative 7a with those estimated by the PRPs for Alternative 7. Since Alternative 7 is comprised of a combination of Alternatives 1 through 6, the respective estimated costs comprising all alternatives are included in Exhibit 22.

Unsaturated zone characterization, injection well investigation and closure, and ground water pumping are needed to meet evaluation criteria for reduction in toxicity, mobility, or volume (characterization is needed to identify toxicity, mobility and volume) and short-term effectiveness. Additional characterization of the saturated zone is needed to improve prospects for achieving aquifer restoration (ARARs). The phased approach to determining whether and how to institute unsaturated zone treatment, emphasis on long-term monitoring, and scheduled reevaluation of the remedy and proposed ARARs constitutes a cost-effective approach to balancing cost and overall effectiveness in light of the existing data gaps.

The aquifer restoration objective is estimated to cost about $ 1.5 million more than implementation of Alternative 7a to achieve UMR restoration. This is considered reasonable at this time considering the mandate under the Ground Water Protection Program to provide a high level of protection to Class IIA aquifers. Should data gathered during Remedial Action indicate that aquifer restoration will be significantly more costly than estimated at this time or that implementability is less feasible than currently estimated, this new information will be factored into the periodic evaluation of ARARs. This is a cost-effective and practical approach.

D. Utilization Of Permanent Solutions Employing Alternative Technologies To The Maximum Extent Practicable

The selected remedy more effectively meets the evaluation criteria for selecting a remedy than Alternatives 1 through 7.

- The selected remedy potentially offers the highest level of protection from contamination both on- and off-site by strategically locating recovery wells in order to remove remnant waste and gross contaminants.
- The selected remedy has the greatest potential to meet aquifer restoration ARARs both on- and off-site.
- Removal of most source material and treating on-site and, possibly, off-site ground water may offer the greatest risk reduction.
- The selected remedy is expected to have the highest level of state and community acceptance.
- Institution of injection well pit excavation, removal of significant waste in the injection well (if detected), pumping and, possibly, unsaturated zone treatment will reduce the volume and mobility of soil and ground water contamination and represents the maximum extent to which permanent solutions and treatment can be practicably utilized. Excavation of bedrock to the bottom of the injection well is considered infeasible.

E. Preference For Treatment As A Principal Element

The selected remedy involves treatment (i.e., ground water pumping and air stripping, well pit excavation and probably, incineration, carbon adsorption at the McIlvain well and possibly ISV, soil flushing, or other unsaturated zone treatment) of ground water, surface water and air to address the principal threats posed by the Injection Well Operable Unit. The ROD for the Landfill Operable Unit will address remediation of threats or potential threats to ground water, surface water, and air caused by the landfill, previous trenching operations, underground storage tanks and other relevant surface operations.

PENNSYLVANIA
DER

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
Post Office Box 2063
Harrisburg, Pennsylvania 17120

Deputy Secretary for
Environmental Protection

717-787-5027

June 30, 1988

Stephen R. Wassersug, Director
Hazardous Waste Management Division
EPA Region III
841 Chestnut Building
Philadelphia, PA 19107

Re: Letter of Concurrence
Henderson Road Superfund Site, Record Of Decision (ROD)

Dear Mr. Wassersug:

The Record Of Decision for the Henderson Road site has been reviewed by the Department. I hereby concur with the EPA's proposed remedy, with the following conditions:

- EPA will assure that the Department is provided an opportunity to fully participate in any negotiations with responsible parties.
- The Department will be given the opportunity to concur with decisions related to the design of the remedial action, to assure compliance with DER design specific ARARs.
- The Department will be given the opportunity to concur with decisions related to implementing any downgradient pump and treat action, any action for the unsaturated soil zone, and any change in cleanup targets, in order to assure compliance with DER cleanup ARARs.
- The Department will reserve our right and responsibility to take independent enforcement actions pursuant to state law.

* This concurrence with the selected remedial action is not intended to provide any assurances pursuant to SARA Section 104(c)(3).

Thank you for the opportunity to concur with this EPA Record Of Decision. If you have any questions regarding this matter please do not hesitate to contact me.

Sincerely,

Mark McClellan

Mark M. McClellan

HENDERSON ROAD SITE
ADMINISTRATIVE RECORD * **
INDEX OF DOCUMENTS

SITE IDENTIFICATION
Background (O'HARA)

1) Memorandum to Mr. Keith Welks from Mr. Paul M. Yaniga re: groundwater contamination, 7/12/77. P. 1-2.

2) Letter to Mr. Mark Rosenberg, Pennsylvania Department of Environmental Resources, from Mr. John W. Hubing, Sr., Ray Printing Company, re: complaint about water contamination, 7/20/77. P. 3-5. A letter regarding well water samples taken at the company is attached.

3) Memorandum to Mr. Wayne L. Lynn from Mr. Paul M. Yaniga re: Industrial Waste - S.W. Disposal, 9/27/77. P. 6-7.

4) Waste Discharge Inspection Report, 12/19/78. P. 8-8.

5) Record of Telephone Conversation to Mr. Don Knorr, Pennsylvania Department of Environmental Resources, from Mr. Musheno re: ABM Disposal injection well in Upper Merion Twp., 1/30/79. P. 9-9.

6) Record of Telephone Conversation to Mr. Dick Riegler, Philadelphia Suburban Water Company, from ABM-O'Hara injection well, 2/6/79. P. 10-10.

7) Letter to Mr. Michael Musheno, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: results of water samples taken at O'Hara test well, 2/15/79. P. 11-11.

8) Letter to Mr. Michael Musheno, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: results of water samples taken at O'Hara test well, 2/23/79. P. 12-12.

9) Sampling data analysis form re: volatile and extractable organics of four drinking water samples, 3/1/79. P. 13-13.

10) Memorandum to Mr. Ramon G. Lee, U.S. EPA, and Mr. Larry Miller, U.S. EPA from Mr. Michael Musheno, U.S. EPA, re: ABM injection and inspected impact on Philadelphia, 3/1/79. P. 14-14.

11) Memorandum to Files from Mr. Michael Musheno, U.S. EPA, re: disposal of industrial wastes, 3/1/79. P. 15-17.

* Administrative Record available 5/31/88.

** Supporting Sampling Data is located at the EPA III Central Regional Laboratory in Annapolis, Maryland.

Note: Company or organizational affiliation is identified in the index only when it appears in the record.

12) Letter to Mr. Donald Knorr, Pennsylvania Department of Environmental Resources, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: results from water samples at O'Hara Test Well, 3/27/79. P. 18-18.

13) Report: A Report on the Pollution Potential of Waste Disposal Activity at the Property of O'Hara Sanitation Company, prepared by International Environmental Engineers, Inc., 4/21/79. P. 19-57.

14) Memorandum to Files from Mr. Michael Musheno, U.S. EPA, re: monitoring of O'Hara Sanitation Company's Henderson Road garage facility, 6/22/79. P. 58-58.

15) Memorandum to Mr. John Austin, U.S. EPA, from Mr. Rick Dreisch, U.S. EPA, re: samples from O'Hara injection wells, 6/29/79. P. 59-59.

16) Memorandum to Mr. Rick Dreisch, U.S. EPA, from Mr. John Austin, U.S EPA, re: purge and trap analysis of samples from O'Hara Station #1, 7/3/79. P. 60-60.

17) Memorandum to Mr. Walter Lee, U.S. EPA, from Mr. T. O. Munson, U.S. EPA, re: purgeable organics analysis of O'Hara injection well samples, 7/6/79. P. 61-61.

18) Memorandum to Mr. Daniel Donnelly, U.S. EPA, from Mr. John Austin, U.S. EPA, re: examination of samples for solvent extractable compounds amenable to gas chromatography, 9/24/79. P. 62-62.

19) Letter to Dr. Walter E. Lee, U.S. EPA, from Mr. David Ben-Hur, Jacobs Engineering Group Inc., re: analytical results of water samples, 3/3/80. P. 63-77. The results are attached.

20) Letter to Dr. Walter F. Lee, U.S. EPA, from Mr. David Ben-Hur, Jacobs Engineering Group, re: analytical sample results, 3/24/80. P. 78-81. The results are attached.

21) Memorandum to File from Mr. Anthony S. Bartolomeo, U.S. EPA, re: site visit to O'Hara Sanitation Company, 5/1/80. P. 82-83.

22) Memorandum to Mr. Anthony S. Bartolomeo, U.S. EPA, from Mr. Ronald Jones, U.S. EPA, re: trip report for A.B.M. O'Hara, 5/1/80. P. 84-85.

23) Memorandum to Mr. Daniel K. Donnelly, U.S. EPA, from Mr. T. O. Munson, U.S. EPA, re: GC/MS Purgeable Organics Analysis of ABM O'Hara RCRA Samples, 5/19/80. P. 86-86.

24) Memorandum to Mr. Anthony S. Bantolomeo [sic], U.S. EPA, from Mr. Daniel K. Donnelly, U.S. EPA, re: Extractable Analysis of ABM O'Hara Samples, 7/1/80. P. 87-90. A table of O'Hara Sample Comparison is attached.

25) Memorandum to Files from Mr. Michael Musheno, U.S. EPA, re: well drilling and monitoring program in the Upper Merion Reservior, 9/15/88. P. 91-91.

26) Memorandum to File from Mr. Joe McGovern, re: O'Hara TDD F3-8009-13, Sequences of Events, 9/26/80. P. 92-93.

27) Memorandum to File from Mr. Robin Aitken, U.S. EPA, re: O'Hara Well Drilling Activities of January 30, 1981, 2/10/81. P. 94-94.

28) Memorandum to File from Mr. Robin Aitken, U.S. EPA, re: O'Hara well drilling activities of February 2, 1981, 2/10/81. P. 95-95.

29) Memorandum to Files from Mr. Robin Aitken, U.S. EPA, re: O'Hara Well Drilling Activities of January 28th and 29th, 1981, 2/11/81. P. 96-96.

30) Letter to Mr. Robin M. Aitken, U.S EPA, from Mr. Kenneth Shull, Philadelphia Suburban Water Company, re: O'Hara sample test results, 2/17/81. P. 97-97.

31) Memorandum to File from Mr. Robin Aitken, U.S. EPA, re: Sampling of O'Hara Wells, 3/9/81. P. 98-98.

32) Handwritten memorandum to File from Mr. C. K. Lee re: preliminary observation of test results for water sampling in O'Hara Sanitation Monitoring Wells, 4/29/81. P. 99-248.

33) Letter to Mr. James Dragna, U.S. EPA, from Evelyn E. Conrad, Midwest Research Institute, and Mr. Earl M. Hansen, Midwest Research Institute, re: results of water sample analysis, 5/11/81. P. 249-292. Graphs and charts are attached.

34) Memorandum to Mr. Ron Naman from Mr. Stan Bumble re: concerning safety working in well at O'Hara Sanitation Job, 5/11/81. P. 293-295. A table and a form regarding chemical composition are attached.

35) Letter to Mr. Robert Kerns from Mr. Joseph J. Melvin, U.S. EPA, re: sample results and hydrogeological data, 8/9/82. P. 296-296.

36) Memorandum to Ms. Linda Young Boornazian, U.S. EPA, from Mr. Joseph G. McGovern, Ecology and Environment, Inc., re: monitoring well keys, 10/11/82. P. 297-304. The following are attached:

    a) handwritten notes regarding well No. 3;
    b) a chain of custody record;
    c) a memorandum regarding October 22, 1982 meeting at O'Hara site;
    d) a file check-up of available documents;
    e) a Service Request Form;
    f) a memorandum regarding field activities of February 7 & 8, 1983;
    g) a letter regarding information on Mr. Ashlam Shah of International Environmental Engineers.

37) Memorandum to Mr. Robin M. Aitken, U.S. EPA, from Mr. Leo J. Clark, U.S. EPA, re: Trip Report of O'Hara Site, 2/16/83. P.305-310. A well pumping data sheet and a site plan are attached.

38) Memorandum to Mr. Daniel K. Donnelly, U.S. EPA, from Mr. Rick Dreisch, U.S. EPA, re: water samples for VOCs by GC/MS Superfund (2/9/83-2/10/83); 830209-01-03, 2/16/83. P. 311-334. The water samples data and Chain of Custody Records are attached.

39) Data: Analytical Results for EPA wells 1, 2, 3 drilled at Site, Church Road and O'Hara Landfill, (undated). P. 335-391.

Background (Philadelphia Suburban Correspondence)

1) Handwritten memorandum to Mr. Mike M. [sic] from Mr. Don K. [sic] re: results of Pennsylvania Department of Environmental Resources samples, 4/23/79. P. 1-1.

2) Memorandum to Files from Mr. Michael Musheno, U.S. EPA, re: developments in the ABM-O'Hara injection well case, 4/26/79. P. 2-4.

3) Memorandum to Mr. Daniel K. Donnelly, U.S. EPA, from Mr. Rick Dreisch, U.S. EPA, re: resolved concentrations of six Halogenated compounds found in Bridgeport drinking water, 4/27/79. P. 5-5.

4) Memorandum to Mr. Michael Musheno, U.S. EPA, from Mr. Daniel Donnelly, U.S. EPA, re: interim report on Philadelphia Suburban Water samples, 4/28/79. P. 6-8. The interim report is attached.

5) Letter to Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, from Mr. Ramon G. Lee, U.S. EPA, re: analytical results of water supply sampling, 4/30/79. P. 9-9.

6) Letter to Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, from Mr. Ramon Lee, U.S. EPA, re: request for Public Water Supply data, organics monitoring capacity, and corrective action feasibility, 4/30/79. P. 10-10.

7) Memorandum to Files from Mr. Michael Musheno, U.S. EPA, re: sample results in the ABM-O'Hara injection well case, 4/30/79. P. 11-11.

8) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: background information on Upper Merion Reservoir Station, 5/4/79. P. 12-13.

9) Letter to R.S. McCracken, Inc. from Mr. Donald F. Knorr re: presence of organic chemicals in well water, 5/10/79. P. 14-14.

10) Memorandum to Files from Mr. Michael Musheno, U.S. EPA, re: Upper Merion Township Groundwater Monitering Survey, 5/18/79. P. 15-23.

11) Memorandum to Mr. Daniel K. Donnelly, U.S. EPA, from Mr. T. O. Munson, U.S. EPA, re: organics analysis of Philadelphia Suburban Water samples, 5/18/79. P. 24-24.

12) Memorandum to Mr. T. O. Munson, U.S. EPA, from Mr. Rick Dreisch, U.S. EPA, re: preliminary findings of trihalomethanes at Philadelphia Suburban Water, 5/21/79. P. 25-25.

13) Letter to Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, from Mr. Ramon G. Lee, U.S. EPA, re: re: request for assistance in pinpointing sample locations, 5/21/79. P. 26-27.

14) Telephone conversation record with Mr. Tom Munson re: May 16, 1979 sample results, 5/21/79. P. 28-29. An interim report on Philadelphia Surburban Water Samples is attached.

15) Memorandum to File from Mr. Michael Musheno, U.S. EPA, re: May 23 sampling of Philadelphia Suburban Water Company Reservoir and Distribution System, 5/23/79. P. 30-31.

16) Split Samples Form, 5/23/79. P. 32-32.

17) Memorandum to Mr. Walter Lee, U.S. EPA, from Mr. T. O. Munson, U.S. EPA, re: summary of Philadelphia Suburban case, 5/25/79. P. 33-39.

18) Memorandum to Mr. Larry S. Miller, U.S. EPA, from Mr. Gregory Koltonuk, U.S. EPA, re: compliance monitering investigations at Knickerbocker Landfill, Philadelphia Water Supply - Upper Merion & other assorted areas, 5/29/79. P. 40-42.

19) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: Philadelphia Suburban Water Company's reasons for not taking the Upper Merion Reservoir out of service, 5/30/79. P. 43-44.

20) Memorandum to Mr. Daniel K. Donnelly, U.S. EPA, from Mr. Rick Dreisch, U.S. EPA, re: water supply results, 6/6/79. P. 45-47.

21) Memorandum to Mr. Walter Lee, U.S. EPA, and Mr. Michael Musheno, U.S. EPA, from Mr. Daniel K. Donnelly, U.S. EPA, re: samples collected at the site, 6/7/79. P. 48-51.

22) Memorandum to Mr. Ramon G. Lee, U.S. EPA, from Mr. Joseph Cotruvo U.S. EPA, re: evaluation of the Philadelphia Suburban Water Supply, 6/19/79. P. 52-54.

23) Memorandum to Files from Mr. Michael Musheno, U.S. EPA, re: inspection of Fisher Scientific Company's King of Prussia Distribution Facility, 6/22/79. P. 55-56.

24) Letter to Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, from Mr. Ramon G. Lee re: request for meeting to discuss Upper Merion contamination problem, 7/6/79. P. 57-57.

25) Memorandum to Files from Mr. Michael Musheno, U.S. EPA, re: May 23 sampling of Philadelphia Suburban Water Company Reservoir and Distribution System, 7/6/79. P. 58-59.

26) Memorandum to Mr. T. O. Munson, U.S. EPA, from Mr. Rick Dreisch re: analysis of benzene and toluene, 7/24/79. P. 60-61.

27) Letter to Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, from Mr. Ramon G. Lee, U.S. EPA, re: meeting on July 18, 1979 concerning contamination of the Upper Merion Reservoir, 7/31/79. P. 62-64.

28) Letter to Mr. Ramon Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: trichloroethylene sample results from the Upper Merion Reservoir, 8/20/79. P. 65-65.

29) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: trichloroethylene sample results from the Upper Merion Reservoir, 8/23/79. P. 66-67.

30) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: additional trichloroethylene sample results from the Upper Merion Reservoir, 8/24/79. P. 68-68.

31) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: additional sample results from the Upper Merion Reservoir, 9/4/79. P. 69-69.

32) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: additional trichloroethylene in sample collected from the Upper Merion Reservoir, 9/6/79. P. 70-70.

33) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE sample results from the Upper Merion Reservoir , 9/17/79. P. 71-71.

34) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: analysis of trichloroethylene in samples collected from the Upper Merion Reservoir, 9/21/79. P. 72-73.

35) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: analysis of trichloroethylene in samples from the Upper Merion Reservoir, 9/24/79. P. 74-74.

36) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: T.C.E. [sic] sample results from the Upper Merion Reservoir, 10/5/79. P. 75-75.

37) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE sample results from the Upper Merion Reservoir, 10/19/79. P. 76-76.

38) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: results of T.C.E. in samples collected from the Upper Merion Reservoir, 10/19/79. P. 77-78.

39) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: additional TCE sample results from Upper Merion Reservoir, 10/23/79. P. 79-80.

40) Memorandum to Mr. Daniel K. Donnelly, U.S. EPA, from Mr. T. O. Munson, U.S. EPA, re: Purgeable Organics Analysis, 10/30/79. P. 81-83.

41) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: additional TCE samples from Upper Merion Reservoir, 11/1/79. P. 84-91. Five letters regarding TCE sample results and a chart of TCE sample results are attached.

42) Memorandum to Mr. Ben Lacy, and other U.S. EPA staff from Ms. Karen DeWald, U.S. EPA, and Mr. Michael McCurdy, U.S. EPA, re: status report on contamination of Philadelphia Suburban Water Company's Upper Merion Reservoir, 12/26/79. P. 92-93.

43) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull Philadelphia Suburban Water Company, re: latest TCE sample results from the Upper Merion Water Reservoir, 1/2/80. P. 94-94.

44) Letter to Mr. Robert L. Townsend, Plymouth Township Office, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: analytical results of water samples for TCE levels in Upper Merion Reservoir, 1/8/80. P. 95-96.

45) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE analytical results, 1/16/80. P. 97-97.

46) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: analysis of water samples, 2/6/80. P. 98-98.

47) Letter to Mr. Michael McCurdy, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE results from Upper Merion Reservoir water, 2/6/80. P. 99-99.

48) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: latest TCE results from the Upper Merion Reservoir, 2/12/80. P. 100-100.

49) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE results from the Upper Merion Reservoir, 3/4/80. P. 101-101.

50) Letter to Mr. Richard Reigler, Philadelphia Suburban Water Company, from Mr. Lee N. Grubman, Leggette, Brashears, and Graham, Inc., re: data regarding February 29 meeting with the EPA, 3/11/80. P. 102-102.

51) Letter to Mr. Michael McCurdy, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: comparison of the gas chromatograms of the Upper Merion water with those of four nearby sources, 3/13/80. P. 103-103.

52) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE sample results from the Upper Merion Reservoir, 3/17/80. P. 104-104.

53) Letter to Mr. Michael McCurdy, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: Hydrogeological study made in the area of the Upper Merion Reservoir, 3/19/80. P. 105-105.

54) Letter to Mr. Michael McCurdy, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: transmittal of the Quarterly Progress Reports on Trace Organic Research Pertaining to the Upper Merion Reservior, 3/21/80. P. 106-115. The report is attached.

55) Letter to Mr. Richard Riegler, Philadelphia Suburban Water Company, from Mr. G. Sidney Fox, Leggette, Brashears & Graham, Inc., re: Upper Merion Reservoir TCE problem, 4/30/80. P. 116-118. A site map is attached.

56) Memorandum to Files from Mr. Michael Musheno, U.S. EPA, re: Philadelphia Suburban Distribution System Monitoring, 7/2/80. P. 119-161. Organics Analysis Data Sheets for sample numbers H_2O Blank #7, H_2O Blank, C0110-C0118 and C0120-C0123 are attached.

57) Letter to Mr. Michael Musheno, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: results for volatile organics, 7/9/80. P. 162-163. The results are attached.

58) Letter to Mr. Tim Jolly, Pennsylvania Department of Environmental Resources, from Mr. Richard R. Riegler, Philadelphia Suburban Water Company, re: Hydrogeological Survey Data - Upper Merion Reservoir T.C.E. [sic] Study, 7/24/80. P. 164-164.

59) Memorandum to Files from Mr. Michael Musheno, U.S. EPA, re: organic monitoring of the pits located near the Upper Merion Reservoir, 8/11/80. P. 165-165.

60) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: latest T.C.E. sample results from the Upper Merion Reservoir, 8/11/80. P. 166-166.

61) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: results of sample analysis of Upper Merion Reservoir for T.C.E. [sic], 9/30/80. P. 167-167.

62) Letter to Mr. Joseph Melvin, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: T.C.E. [sic] sample results from the Upper Merion Reservoir and Gulf Road School, 1/8/81. P. 168-170. A sample location map and a chart of Upper Merion Reservoir Depth Samples are attached.

63) Letter to Mr. Richard Riegler, Philadelphia Suburban Water Company, from Mr. Lee N. Grubman, Leggette, Brashears & Graham, Inc., re: Upper Merion Reservoir TCE Study, 3/3/81. P. 171-185. Graphs of test results are attached.

64) Memorandum to Mr. Earl H. Graham from Mr. Kenneth E. Shull re: Upper Merion Reservoir TCE problem, 4/6/81. P. 186-188.

65) Letter to Mr. Ramon G. Lee, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE sample results from Upper Merion Reservoir, 5/20/81. P. 189-189.

66) Letter to Mr. Robert J. Blanco, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE sample results from the Upper Merion Reservoir, 7/14/81. P. 190-191.

67) Letter to Mr. Robert J. Blanco, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: latest TCE sample results from the Upper Merion Reservoir, 8/18/81. P. 192-192.

68) Letter to Mr. Robert J. Blanko [sic], U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE sample results from the Upper Merion Reservoir, 10/28/81. P. 193-193.

69) Letter to Mr. Robert J. Blanco, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE sample results from the Upper Merion Reservoir, 12/29/81. P. 194-194.

70) Letter to Mr. Robert J. Blanco, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE concentration found in the Upper Merion Reservoir water, 1/13/82. P. 195-195.

71) Letter to Mr. Joseph Melvin, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: organic compounds found in Upper Merion Reservior water, 2/19/82. P. 196-196.

72) Report: *Progress Report, Packed Tower Aeration for Upper Merion Reservoir, Design Remediations*, prepared by Mr. Thomas L. Yohe, Mr. Richard R. Riegler and Mr. Preston Luitweiler, 3/22/82. P. 197-252.

73) Letter to Mr. Robert J. Blanco, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE sample results from the Upper Merion Reservoir, 4/2/82. P. 253-253.

74) Letter to Mr. Robert J. Blanco, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: latest TCE sample results from the Upper Merion Reservoir, 5/3/82. P. 254-255.

75) Letter to Mr. Robert J. Blanco, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE sample results from the Upper Merion Reservoir, 9/15/82. P. 256-257.

76) Letter to Mr. Robert J. Blanco, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE sample results from the Upper Merion Reservoir, 10/7/82. P. 258-258.

77) Letter to Mr. Robert J. Blanco, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE sample results from the Upper Merion Reservoir, 11/2/82. P. 259-260. A graph of monthly averages of TCE is attached.

78) Letter to Mr. Robert J. Blanco, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE sample results from the Upper Merion Reservoir, 12/6/82. P. 261-262. A graph of monthly averages of TCE is attached.

79) Letter to Mr. Robert J. Blanco, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE sample results from the Upper Merion Reservoir, 4/8/83. P. 263-264. A graph of monthly averages of TCE is attached.

80) Letter to Mr. C. K. Lee, NUS Corporation, from Mr. Thomas J. Roberts, Philadelphia Suburban Water Compnay, re: transmittal of the Philadelphia Suburban Water Company Ground-water Contamination at Upper Merion Reservoir Interm Report, 5/16/83. P. 265-274. The report is attached.

81) Letter to Mr. Robert J. Blanco, U.S. EPA, from Mr. Kenneth E. Shull, Philadelphia Suburban Water Company, re: TCE sample results from the Upper Merion Reservoir, 6/13/83. P. 275-275.

82) Letter to Ms. Paula Luborsky, U.S. EPA, from Mr. Thomas L. Yohe, Philadelphia Suburban Water Company, re: transmittal of VOC data raw and treated water from the Upper Merion Reservoir, 4/3/86. P. 276-279.

Background (Philadelphia Suburban - Reports)

1) Report: Completion Report, Crooked Lane Well of the Philadelphia Suburban Water Company, prepared by Mr. Jack B. Graham, Leggette, Brashears & Graham, Inc., 3/66. P. 1-8. Four water well log forms are attached.

2) Report: TCE and Other Organics in Ground Water: A Case Study, prepared by Mr. Kenneth E. Shull and Mr. Thomas L. Yoke, Philadelphia Suburban Water Company, 4/23/81. P. 9-58.

3) Report: Influence of the Recovery Water Level on Stability and Sinkhole Activity, Upper Merion Reservoir, Philadelphia Suburban Water Company, prepared by Woodward-Clyde Consultants, (undated). P. 59-90.

4) Report: Upper Merion Reservoir, Philadelphia Suburban Water Company (no author sited), (undated). P. 91-99.

5) Report: TCE and How We Are Dealing With It (no author cited), (undated). P. 100-102.

6) Report: Upper Merion Reservoir, Philadelphia Suburban Water Company (no author cited), (undated). P. 104-162.

Preliminary Assessment and Site Inspection Reports

1) Report: Preliminary Assessment and Site Inspection of O'Hara Sanitation Company, Inc., prepared under TDD. No. F3-8305-05, EPA No. PA-162, Contract No. 68-01-6699, prepared by NUS Corporation, 5/23/85. P. 1-172.

2) Report: O'Hara Sanitation Monitoring Wells, prepared by Ecology and Environment, Inc., (undated). P. 173-331.

REMEDIAL ENFORCEMENT PLANNING
Potentially Responsible Party Correspondence

1) Memorandum of Installment Sale Agreement between Montgomery County Industrial Development Authorty and Mr. William J. and Mrs. Betty E. O'Hara, 10/9/75. P. 1-8. A deed is attached.

2) Dun and Bradstreet report re: O'Hara Sanitation Company, 4/3/80. P. 9-9.

3) Letter to Mr. William O'Hara, Jr., O'Hara Sanitation Company, from Mr. Joseph J. Melvin, U.S. EPA, re: EPA's plans to determine the extent of ground water contamination in the area around the Upper Merion Reservoir, 1/7/81. P. 10-11. A certified mail receipt is attached.

4) Letter to Mr. Joseph J. Melvin, U.S. EPA, from Mr. Robert J. Kerns, Landis, Williams and Kerns, re: granting of permission to drill for samples at O'Hara Sanitation, 1/28/81. P. 12-12.

5) Letter to Mr. Robert J. Kerns, U.S. EPA, from Mr. Joseph J. Melvin, U.S EPA, re: arranging a meeting to discuss ground water contamination in Upper Merion area, 5/19/82. P. 13-13.

6) Letter to Mr. Robert Kerns from Mr. Joseph J. Melvin, U.S. EPA, re: lack of response to request for additional technical data, 10/6/82. P. 14-14.

7) Letter to Mr. Joseph J. Melvin, U.S. EPA, from Mr. Robert J. Kerns, Land Williams and Kern, re: request for additional technical data, 10/13/82. P. 15-15.

8) Handwritten memorandum to File from Mr. Robin Aitken re: Oct. 22, 1982 meeting on O'Hara site, 10/22/82. P. 16-16.

9) Letter to Mr. Robert Kerns, U.S. EPA, from Mr. Joseph J. Melvin, U.S. EPA, re: release of additional technical information, 11/17/82. P. 17-17.

10) Letter to Mr. Joseph Melvin, U.S. EPA, from Mr. Robert Kerns, Landis, Williams, and Kerns, re: acknowledgment of receipt of technical information, 12/2/82. P. 18-18.

11) Letter to Mr. Robert Kerns, U.S. EPA, from Mr. Joseph Melvin, U.S. EPA, re: importance of immediate clean-up of O'Hara site, 12/10/82. P. 19-20. A certified mail receipt is attached.

12) Letter to Mr. Joseph J. Melvin, U.S. EPA, from Mr. Robert J. Kerns, Landis, Williams and Kerns, re: additional technical information, 12/31/82. P. 21-21.

13) Letter to Mr. Robert Kerns, U.S. EPA, from Mr. Joseph J. Melvin, U.S. EPA, re: two primary goals in negotiating a clean-up settlement, 1/26/83. P. 22-23.

14) Letter to Mr. Robert Kerns, U.S. EPA, from Mr. Joseph J. Melvin, U.S. EPA, re: analysis confirmation of serious ground water contamination at O'Hara site, 3/31/83. P. 24-36. A consent decree is attached.

15) Letter to Mr. Joseph Melvin, U.S. EPA, from Mr. Robert J. Kerns, Landis, Williams and Kerns, re: request for additional information, 4/15/83. P. 37-37.

16) Letter to Mr. Terrence A. Shannon, NUS Corporation, from Mr. Robert J. Kerns, Landis, Williams and Kerns, re: denial of permission to inspect O'Hara site, 5/13/83. P. 38-39. An envelope is attached.

17) Letter to Mr. Robert J. Kerns, Landis, Williams and Kerns, from Mr. Joseph Melvin, U.S. EPA, re: EPA inspection of O'Hara facilities, 5/31/83. P. 40-40.

18) Letter to Haven Chemical from Mr. Stephen R. Wassersug, U.S. EPA, re: 104(e) request letter, 8/17/84. P. 41-44. A certified mail receipt is attached.

19) Letter to Congoleum Corporation from Mr. Stephen R. Wassersug, U.S. EPA, re: 104(e) request letter, 8/17/84. P. 45-47. A certified mail receipt is attached.

20) Letter to Gould, Inc. from Mr. Stephen R. Wassersug, U.S. EPA, re: 104(e) request letter, 8/17/84. P. 48-51. Two certified mail receipts are attached.

21) Letter to SmithKline Chemicals from Mr. Stephen R. Wassersug, U.S. EPA, re: 104(e) request letter, 8/17/84. P. 52-54. A certified mail receipt is attached.

22) Letter to O'Hara Sanitation Company, Inc., from Mr. Stephen R. Wassersug, U.S. EPA, re: 104(e) request letter, 8/17/84. P. 55-57. A certified mail receipt is attached.

23) Letter to Howmet Aluminum Corporation from Mr. Stephen R. Wassersug, U.S. EPA, re: 104(e) request letter, 8/17/84. P. 58-60. A certified mail receipt is attached.

24) Letter to Childers Products, Inc. from Mr. Stephen R. Wassersug, U.S. EPA, re: 104(e) request letter, 8/17/84. P. 61-62. A certified mail receipt is attached.

25) Letter to Omega Chemical from Mr. Stephen R. Wassersug, U.S. EPA, re: 104(e) request letter, 8/17/84. P. 63-67. Three certified mail receipts are attached.

26) Letter to Mr. Robin [sic] from Mr. Chuck Dalena re: correspondence pertaining to ABM Disposal, 8/22/84. P. 68-106. The correspondence is attached.

27) Letter to Mr. Robin Aitken, U.S. EPA, from Mr. Bruce A. Schuck, E.F. Houghton & Co., re: 104(e) request information response, 8/29/84. P. 107-110. A certified mail receipt and a 104(e) letter are attached.

28) Memorandum to File from Ms. K. Hodgkiss, U.S. EPA, re: 104(e) request for Sandvik Inc., 8/31/84. P. 111-113. The 104(e) letter is attached.

29) Letter to Mr. Robin Aitken, U.S. EPA, from Mr. John M. Hatch, Alumax Aluminum Corporation, re: supporting exhibit files, 9/10/84. P. 114-133. The exhibit files are attached.

30) Letter to Mr. Robin Aitken, U.S. EPA, from Mr. William J. O'Hara, Jr., O'Hara Sanitation Co. Inc., re: 104(e) request for information, 9/14/84. P. 134-138. An envelope and a 104(e) letter are attached.

31) Letter to Mr. Robin Aitken, U.S. EPA, from Mr. Richard George, Congoleum Corporation, re: 104(e) request for information, 9/21/84. P. 139-139.

32) Record of telephone conversation to SmithKline Chemicals from Mr. Robin Aitken re: 104(e) letter dated August 17,1984, 10/30/84. P. 140-141. A certified mail receipt is attached.

33) Letter to Mr. William J. O'Hara, Sr., O'Hara Sanitation Co. Inc., from Mr. Stephen R. Wassersug, U.S. EPA, re: EPA consideration to spend public funds to investigate and take corrective action at the Henderson Road site, 11/9/84. P. 142-145.

34) Letter to Mrs. Betty E. O'Hara, O'Hara Sanitation Co. Inc., from Mr. Stephen R. Wassersug, U.S. EPA, re: EPA consideration to spend public funds to investigate and take corrective action at the Henderson Road Site, 11/9/84. P. 146-149.

35) Letter to Mr. Douglas Hickey, Montgomery County Industrial Development Authority (MCIDA), from Mr. Stephen R. Wassersug, U.S. EPA, re: EPA consideration to spend public funds to investigate and take corrective action at the Henderson Road site, 11/9/84. P. 150-154.

36) Routing and Transmittal Slip re: no signature on returned certified mail receipt, 11/14/84. P. 155-156. A certified mail receipt is attached.

37) Letter to Mr. Robin M. Aitken, U.S. EPA, from Mr. John M. Cullen, SmithKline Beckman, re: 104(e) request information, 11/15/84. P. 157-162. Two letters regarding 1977 SmithKline Beckman/ABM incident and a handwritten note regarding the investigation at Henderson Road are attached.

38) Letter to Ms. Paula Luborsky, U.S. EPA, from Mr. Steven E. Speece, Timoney, Knox, Hasson and Weand, re: 104(e) letter sent to Mr. William J. and Mrs. Betty E. O'Hara, 11/19/84. P. 163-164.

39) Memorandum to Mr. Joe Melvin, U.S. EPA, from Ms. Paula Luborsky, U.S. EPA, re: SmithKline Beckman response to 104(e) letter, 11/21/84. P. 165-165.

40) Letter to Ms. Paula Luborsky, U.S. EPA, from Mr. John M. Cullen, SmithKline Beckman, re: preliminary response to November 9, 1984 letter, 11/21/84. P. 166-167. An envelope is attached.

41) Letter to Mr. Stephen R. Wassersug, U.S. EPA, from Mr. Roger B. Reynolds, Reynolds, McLaughlin, Josel and Reynolds, re: 104(e) letter to MCIDA, 12/5/84. P. 168-169.

42) Letter to Ms. Paula Luborsky, U.S. EPA, from Mr. Douglas L. Hickey, Jr., Montgomery County Industrial Development Authority, re: response to EPA notification of 11/9/84. P. 170-171.

43) Letter to Mr. Joseph Melvin, U.S. EPA, from Mr. Steven E. Speece, Timoney, Knox, Hasson and Weand, re: response to EPA questions concerning O'Hara property, 12/18/84. P. 172-173.

44) Letter to Mr. Joseph J. Melvin, U.S. EPA, from Mr. John M. Cullen, SmithKline Berkman, re: SmithKline Beckman discussion of the ABM matter, 1/14/85. P. 174-174.

45) Letter to Ms. Paula Luborsky, U.S. EPA, from Mr. Douglas L. Hickey, Jr., Montgomery County Industrial Development Authority, re: Montgomery County Industrial Development Authority Change of address, 1/15/85. P. 175-175.

46) Letter to Mr. Michael Giangiordano, Montgomery County Industrial Development Authority, from Ms. Paula Luborsky, U.S. EPA, re: request for information on Henderson Road Site, 5/22/85. P. 176-176.

47) Desk memorandum to Ms. Paula Luborsky, from Mr. Dave Crownover re: letter from Waste Management to O'Hara and Department of Environmental Resources, 6/7/85. P. 177-179. A letter regarding telephone conversation on May 13, 1985 and a letter regarding waste materials are attached.

48) Memorandum to File from Ms. Paula Luborsky, U.S. EPA, re: Hnederson Road Notice Letter response, 6/17/85. P. 180-180.

49) Letter to Mr. Bill Taylor, Gould Inc., from Mr. Roland W. Schrecongost, U.S. EPA, re: EPA consideration to spend public funds to investigate and take corrective action at Henderson Road site, 6/13/85. P. 181-185.

50) Letter to Mr. Joseph Skrobak, Sandvik Steel Company, from Mr. Roland W. Schrecongost, U.S. EPA, re: EPA consideration to spend public funds to investigate and take corrective action at Henderson Road site, 6/13/85. P. 186-190.

51) Letter to Mr. John M. Hatch, Alumax Aluminum Corporation, from Mr. Roland W. Schrecongost, U.S. EPA, re: EPA consideration to spend public funds to investigate and take corrective action at Henderson Road site, 6/13/85. P. 191-195. A certified mail receipt is attached.

52) Letter to Mr. Charles Dalena, Childers Products Company, Inc., from Mr. Roland W. Schrecongost, U.S. EPA, re: EPA consideration to spend public funds to investigate and take corrective action at Henderson Road site, 6/13/85. P. 196-198.

53) Letter to Mr. John W. Kane, Jr., Scott Paper Company, from Mr. Roland W. Schrecongost, U.S. EPA, re: EPA consideration to investigate and take corrective action at Henderson Road site, 6/13/85. P. 199-203.

54) Routing and Transmittal Slip to Mr. John Melvin, U.S. EPA, from Mr. Jessie Blingino [sic], re: Congoleum Corporation, 6/14/85. P. 204-208. A letter regarding EPA consideration to investigate and take corrective action at Henderson Road site is attached.

55) Letter to Ms. Marilyn Klug, Cohen & Shapiro, from Ms. Susan D. Cooke, United States Department of Justice, re: documents on United States -v- Wade related to the ABM-O'Hara site, 6/20/85. P. 209-209gg. Grid for April 1974 through December 1975, and January 1977, and a key to grid are attached.

56) Letter to Mr. Joseph J. Melvin, U.S. EPA, from Mr. Peter C. McGuire, Alumax, Inc., re: 104(e) request information, 6/19/85. P. 210-211.

57) Letter to Mr. Hershel J. Richman, Cohen, Shapiro, Polisher, Shiekman and Cohen, from Mr. Joseph J. Melvin, U.S. EPA, re: meeting regarding the proposed Remedial Investigation and Feasibility Study for the Henderson Road site, 6/21/85. P. 212-213. A certified mail receipt is attached.

58) Letter to Mr. Steve Speece, Timoney, Knox, Hasson, and Weand, from Mr. Joseph J. Melvin, U.S. EPA, re: meeting regarding the proposed Remedial Investigation and Feasibility Study for the Henderson Road site, 6/21/85. P. 214-214.

59) Letter to Mr. Everett Milton, GNB, Inc., from Mr. Joseph J. Melvin, U.S. EPA, re: meeting regarding the proposed Remedial Investigation and Feasibility Study for the Henderson Road Site, 6/21/85. P. 215-215.

60) Letter to Mr. Nicholas DiBenedictus [sic], Scott Paper Company, from Mr. Joseph J. Melvin, U.S. EPA, re: proposed Remedial Investigation and Feasibility Study for the Henderson Road site, 6/21/85. P. 216-216.

61) Letter to Mr. Richard George, Congoleum Corporation, from Mr. Joseph J. Melvin, U.S. EPA, re: proposed Remedial Investigation and Feasibility Study for the Henderson Road site, 6/21/85. P. 217-217.

62) Letter to Mr. Robert Andrews, Childers Products Company, Inc., from Mr. Joseph J. Melvin, U.S. EPA, re: proposed Remedial Investigation and Feasibility Study for the Henderson Road site, 6/21/85. P. 218-218.

63) Letter to Mr. Peter McGuire, Alumax Incorporated, from Mr Joseph J. Melvin, U.S. EPA, re: proposed Remedial Investigation and Feasibility Study for the Henderson Road site, 6/21/85. P. 219-219.

64) Letter to Mr. Roland W. Schrecongost, U.S. EPA, from Mr. Scott Patterson, Saul, Ewing, Remick and Saul, re: response to June 13, 1985 EPA request for information, 7/1/85. P. 220-220.

65) Letter to Ms. Paula Luborsky, U.S. EPA, from Mr. Nicholas DiBenedictus re: Henderson Road site - CERCLA and RCRA Information Request, 7/15/85. P. 221-224. Two transactions with O'Hara for dump abbreviation forms are attached.

66) Letter to Ms. Paula Luborsky, U.S. EPA, from Mr. Michael Giangiordano, Montgomery County Industrial Development Authority, re: Montgomery County Industrial Development Authority's Articles of Incorporation, Bylaws, and Resolutions concerning O'Hara Sanitation Co., Inc., 8/14/85. P. 225-256. The Articles of Incorporation, Bylaws and Resolutions are attached.

67) Letter to Mr. Michael Steiner, Timothy, Knox and Weand, from Mr. Steven E. Speece, Pennsylvania Department of Environmental Resources, re: request for all documents and records pertaining to the O'Hara Site, 3/25/85. P. 257-258.

68) Letter to Mr. Joseph Mazzie, Sun Oil Co., from Mr. Stephen Wassersug, U.S. EPA, re: Henderson Road site, 8/19/85. P. 259-264. A certified mail receipt is attached.

69) Letter to Mr. John W. Kane, Scott Paper Company, from Ms. Paula Luborsky, U.S. EPA, re: Henderson Road site, 8/20/85. P. 265-267. A list of Potentially Responsible Parties is attached.

70) Memorandum to File from Ms. Paula Luborsky, U.S. EPA, re: Henderson Road Site, 8/21/85. P. 268-268.

71) Memorandum to File from Ms. Paula Luborsky, U.S. EPA, re: Sun Oil, 8/23/85. P. 269-269.

72) Letter to Engineering Services, Inc., from Mr. Stephen Wassersug, U.S. EPA, re: request for information concerning release of hazardous substances into the environment, 8/27/85. P. 270-273. A certified mail receipt is attached.

73) Letter to Ms. Paula Luborsky, U.S. EPA, from Mr. Michael Giangiordano, Montgomery County Industrial Development Authority, re: O'Hara Sanitation, Inc., 8/28/85. P. 274-297. The Montgomery County Industrial Development Authority Resolutions and a transmittal letter are attached.

74) Letter to Ms. Paula Luborsky, U.S. EPA, from Mr. Arthur J. Raymond, Sun Refining and Marketing Company, re: Henderson Road Site, 9/3/85. P. 298-298.

75) Letter to Ms. Maureen Barden, U.S. EPA, from Mr. Edward J. Ciechon, Sun Refining and Marketing Company, re: Henderson Road Site, 9/24/85. P. 299-300.

76) Letter to Ms. Maureen Barden, U.S. EPA, from Mr. Edward J. Ciechon, Sun Refining and Marketing Company, re: confirmation of telephone conversation regarding Henderson Road Site, 10/2/85. P. 301-301.

77) Letter to Mr. Patrick O'Hara, O'Hara Sanitation Company, from Pennsylvania Department of Environmental Resources, re: Notice of Violation, 10/21/85. P. 302-310. The following are attached:

    a) A transmittal note;
    b) a water quality report;
    c) a laboratory report for sample No. 8518204;
    d) a special analysis report;
    e) a laboratory report for sample no. 852891.

78) Letter to Mr. John Wilmer, U.S. EPA, from Mr. Stephen E. Speece, Timoney, Knox, Hassen and Weand, re: Notice of Violation - October 21, 1985, 11/12/85. P. 311-312.

79) Letter to Engineering Services, Inc. from Ms. Kathryn Hodgkiss, U.S. EPA, re: Henderson Road Site, 11/12/85. P. 313-315. A certified mail receipt is attached.

80) Letter to Mr. Stephen E. Speece, Timoney, Knox, Hassen and Weand, from Ms. Maureen Barden, U.S. EPA, re: Remedial Investigation/ Feasibilty Study (RI/FS) at the Henderson Road Site, 11/15/85. P. 316-316.

81) Memorandum to File from Ms. Paula Luborsky, U.S. EPA, re: Henderson Road Site, 104(e) Response, 11/21/85. P. 317-317.

82) Letter to Mr. Steven E. Speece, Timoney, Knox, Hassen and Weand, from Ms. Maureen Barden, U.S. EPA, re: Henderson Road Site, 11/21/85. P. 318-319.

83) Letter to Ms. Gerallyn Downs-Valls [sic], U.S. EPA from Mr. Bradford F. Whitman, Dechert, Price and Rhoads, re: Henderson Road Site, 2/26/87. P. 320-320.

84) Letter to Mr. Walter S. Graham, U.S. EPA, from Mr. Michael C. Veysey, Gould Electronics, Inc. re: Henderson Road Investigation and Feasibilty Study, 3/6/87. P. 321-321.

85) Letter to Mr. Nicholas DeBenedictus, Scott Paper Company, from Mr. James Seif, U.S. EPA, re: Henderson Road National Priority List (NPL) Injection Well Site, 5/11/88. P. 322-329. A certified mail receipt is attached.

86) Letter to Mr. Joseph Skrobak, Sandvik Steel Company, from Mr. James Seif, U.S. EPA, re: Henderson Road NPL Injection Well Site, 5/11/88. P. 330-337. A certified mail receipt is attached.

87) Letter to Ms. Betty O'Hara, O'Hara Sanitation Company, Inc., from Mr. James Seif, U.S. EPA, re: Henderson Road NPL Injection Well Site, 5/11/88. P. 338-346. A certified mail receipt and a Henderson Road NPL Site Investigation Request instructions sheet are attached

88) Letter to Mr. J. Kucera, Alumax Aluminum Corporation, from Mr. James Seif, U.S. EPA, re: Henderson Road NPL Injection Well Site, 5/11/88. P. 347-354. A certified mail receipt is attached.

89) Letter to Mr. Michael Giangiordano, Montgomery County Industrial Development Authority, from Mr. James Seif, U.S. EPA, re: Henderson Road NPL Injection Well Site, 5/11/88. P. 355-359. A certified mail receipt is attached.

90) Letter to Mr. Edward J. Ciechon, Jr., Sun Refining and Marketing Company, from Mr. James Seif, U.S. EPA, re: Henderson Road NPL Injection Well Site, 5/11/88. P. 360-367. A certified mail receipt is attached.

91) Letter to Mr. Michael C. Veysey, Gould, Inc., from Mr. James Seif, U.S. EPA, re: Henderson Road NPL Injection Well Site, 5/11/88. P. 368-375. A certified mail receipt is attached.

92) Letter to Mr. Richard George, Congoleum Corporation, from Mr. James Seif, U.S. EPA, re: Henderson Road NPL Injection Well Site, 5/11/88. P. 376-383. A certified mail receipt is attached.

93) Letter to Mr. John Cullen, SmithKline Beckman Corporation, from Mr. James Seif, U.S. EPA, re: Henderson Road NPL Injection Well Site, 5/11/88. P. 384-391. A certified mail receipt is attached.

94) Letter to Mr. William J. O'Hara, Sr., O'Hara Sanitation Company, Inc., from Mr. James Seif, U.S. EPA, re: Henderson Road NPL Injection Well Site, 5/11/88. P. 392-400. A certified mail receipt and a Henderson Road NPL site second Information Request Instructions Sheet are attached.

95) Letter to Mr. Chuck Delera, Childers Products Company, Inc., from Mr. James Seif, U.S. EPA, re: Henderson Road NPL Injection Well Site, 5/11/88. P. 401-409. A certified mail receipt and a site map are attached.

96) Letter to Ms. Maureen Barden, U.S. EPA, from John P. Judge, Cohen, Shapiro, Polisher, Shiekman and Cohen, re: Henderson Road NPL Site, 5/20/88. P. 410-410.

97) Letter to Ms. Gerallyn Downs-Valls [sic], U.S. EPA, from Bradford F. Whitman, Dechert, Price and Rhoads, re: CERCLA Section 104(e) Information Request, 5/24/88. P. 411-411.

98) Letter to Mr. Douglas Hickey, Montgomery County Industrial Development Authority, from Ms. Paula Luborsky, U.S. EPA, re: Henderson Road Site, (undated). P. 412-412.

99) Letter to Mr. William J. O'Hara, O'Hara Sanitation Company, from Mr. James M. Seif, U.S. EPA, re: 104(e) request for information, 5/11/88. P. 413-421. A certified mail receipt and a Henderson Road NPL Site second Information Request Instructions Sheet are attached.

100) Letter to Continental Fibre Company from Mr. Bruce Smith, U.S. EPA, re: information concerning release of hazardous substances into the environment, 5/17/88. P. 422-426. A certified mail receipt is attached.

101) Letter to Mr. Morris S. Cupp, Superior Tube Company, from Mr. Bruce Smith, U.S. EPA, re: request for information concerning release of hazardous substances into the environment, 5/17/88. P. 427-431. A certified mail receipt is attached.

102) Letter to Mid-East Aluminum Company from Mr. Bruce Smith, U.S. EPA, re: request for information concerning release of hazardous substances into the environment, 5/17/88. P. 432-436. A certified mail receipt is attached.

103) Letter to Vicks Manufacturing Company from Mr. Bruce Smith, U.S. EPA, re: request for information concerning release of hazardous substances into the environment, 5/17/88. P. 437-442. A certified mail return receipt and a Routing and Transmittal slip are attached.

Signed Orders

1) Administrative Order on Consent in the Matter of Henderson Road Site, 11/1/85. P. 1-36.

REMEDIAL RESPONSE PLANNING

Remedial Investigation/Feasibility Study Reports

1) Report: Site Investigation and Inventory, Upper Merion Township, Pennsylvania, Volume I, prepared by Mr. Peter M. Stokely, The Bionetics Corporation, 6/84. P. 1-36. References are attached to P. 36.

2) Report: Description of Current Situation Henderson Road Site, prepared by Camp, Dresser and McKee, Inc., and Roy F. Weston, Inc., 2/85. P. 37-142.

3) Report: Letter Report, prepared by NUS Corporation, 9/9/85. P. 143-154.

4) Report: A Hydrological Study For Potential Sites Near Norristown Prepared Under TDD No. F3-8303-42, EPA No., Contract No. 68-01-6699, prepared by NUS Corporation, 3/13/86. P. 155-233.

5) Report: Status Report Henderson Road Prepared Under TDD No. F3-8511-02, EPA No. PA-162, Contract No. 68-01-6699, prepared by NUS Corporation, 4/1/86. P. 234-286.

6) Report: Status Report No. 2 For Henderson Road, King of Prussia, Pennsylvania, prepared by NUS Corporation, 5/6/86. P. 287-303.

7) Report: Status Report Henderson Road Prepared Under TDD No. F3-8511-02, EPA No. PA-162, Contract No. 68-01-6699, prepared by NUS Corporation, 6/17/86. P. 304-327.

8) Report: Status Report, Field Trip Summary, prepared by NUS Corporation, 9/25/86. P. 328-337j.

9) Report: Status Report For Henderson Road, King of Prussia, Pennsylvania, prepared by NUS Corporation, 3/10/87. P. 338-361.

10) Report: Final Draft, Remedial Investigation Well Operable Unit, Volume 1, For Henderson Road Site, Upper Merion Township, Montgomery County, Pennsylvania, prepared by BCM Engineers, 4/4/88. P. 362-606.

11) Report: Final Draft, Remedial Investigation Report Injection Well Operable Unit, Volume II - Appendices 1 through 8 For Henderson Road Site, Upper Merion Township, Montgomery County, Pennsylvania, prepared by BCM Engineers, 4/4/88. P. 607-904.

12) Report: Final Draft, Remedial Investigation Report Injection Well Operable Unit, Volume II - Appendices 9 through 25 For Henderson Road Site, Upper Merion Township, Montgomery County, Pennsylvania, prepared by BCM Engineers, 4/4/88. P. 905-1167.

13) Report: Final Draft, Feasibility Study Report For Henderson Road Injection Well Site, Upper Merion Township, Montgomery County, Pennsylvania, prepared by BCM Engineers, 4/5/88. P. 1168-1593. References are listed on P. 1474-1474.

14) Report: Split Sample Results (12/19/85) - BCM & EPA - Standing Water in Injection Well Pit (no author cited), (undated). P. 1594-1737.

15) Report: Feasibility Study Report Injection Well Operable Unit for Henderson Road PRP Committee, prepared by BCM Engineers, Inc., 6/88. P. 1738-2049.

16) Report: Feasibility Study Report Injection Well Operable Unit for Henderson Road PRP Committee, Volume I, prepared by BCM Engineers, Inc., 6/88. P. 2050-2294.

17) Report: Feasibility Study Report Injection Well Operable Unit for Henderson Road PRP Committee, Volume II - Appendices 1-8, prepared by BCM Engineers, Inc., 6/88. P. 2295-2641.

18) Report: Feasibility Study Report Injection Well Operable Unit for Henderson Road PRP Committee, Volume III - Appendices 9-25, prepared by BCM Engineers, Inc., 6/88. P. 2642-2988.

COMMUNITY INVOLVEMENT
Community Relations Plans

1) Final Community Relations Plan for the Henderson Road Site, Upper Merion Township, Montgomery County, Pennsylvania, prepared by Camp, Dresser and McKee, Inc., 6/22/85. P. 1-24.

Fact Sheets, Press Releases, Public Notices

1) News Release re: Low Levels Of Industrial Compounds Founds In The Philadelphia Suburban Water Company's Upper Merion Reservoir, 5/21/79. P. 1-1.

2) Press Release from U.S. EPA Environmental News entitled "Chemicals Discovered in Reservior," 5/21/79. P. 2-2.

3) Press Release from U.S. EPA Environmental News entitled "EPA Releases Results Of Water Samples On Upper Merion Reservoir, 7/3/79. P. 3-3a.

4) Press Release from U.S. EPA Environmental News entitled "EPA Schedules Public Meeting For Henderson Road Superfund Site," 6/28/85. P. 4-4.

5) Press Release from U.S. EPA Environmental News entitled "EPA Enters Consent Order To Investigate The Henderson Road Superfund Site," 12/9/85. P. 5-5.

6) Fact Sheet re: clean-up alternatives (undated). P. 6-7. An attendance list is attached.

7) Public Notice re: public meeting at King of Prussia, 4/22/88. P. 8-9. An article entitled "EPA Extends Public Review of Toxic Site Cleanup Plan" is attached.

SITE SPECIFIC GUIDANCE DOCUMENTS

1) Memorandum to Weldwire and O'Hara Files from Mr. Anthony S. Bartolomeo, U.S. EPA, re: air pollution potential from Upper Merion Reservoir Aeriation vs. Typical Dry Cleaning Plant, 5/14/80.

2) Letter to Mr. James Dragna, U.S. EPA, from Mr. Dennis K. Stewart, United States Department of the Interior, re: transmittal to the Lineament and Fracture - trace analysis for Kessler Site, Upper Merion Township, Pennsylvania report, 6/28/82. The report is attached.

3) Letter to Ms. Stephany Del Re, U.S. EPA, from Mr. Charles R. Wood, United States Department of the Interior, re: contaminants in the ground water, 10/21/83.

4) Memorandum to Mr. Charles J. Walters, U.S. EPA, from the Toxicologist, Department of Health and Human Servces, re: guidance for remediation of the subject site groundwater, 4/21/88.

GENERAL GUIDANCE DOCUMENTS *

1) "Promulgation of Sites from Updates 1-4," Federal Register, dated 6/10/86.

2) "Proposal of Update 4," Federal Register, dated 9/18/85.

3) Memorandum to U. S. EPA from Mr. Gene Lucero regarding community relations at Superfund Enforcement sites, dated 8/28/85.

4) Groundwater Contamination and Protection, undated by Mr. Donald V. Feliciano on 8/28/85.

5) Memorandum to Toxic Waste Management Division Directors Regions I-X from Mr. William Hedeman and Mr. Gene Lucero re: Policy on Floodplains and Wetlands Assessments for CERCLA Actions, 8/6/85.

6) Guidance on Remedial Investigations under CERCLA, dated 6/85.

7) Guidance on Feasibility Studies under CERCLA, dated 6/85.

8) "Proposal of Update 3," Federal Register, dated 4/10/85.

9) Memorandum to Mr. Jack McGraw entitled "Community Relations Activites at Superfund Sites - Interim Guidance," dated 3/22/85.

10) "Proposal of Update 2," Federal Register, dated 10/15/84

11) EPA Groundwater Protection Strategy, dated 9/84.

12) Memorandum to U.S. EPA from Mr. William Heckman, Jr. entitled "Transmittal at Superfund Removal Procedures - Revision 2," dated 8/20/84.

13) "Proposal of Update 1," Federal Register, dated 9/8/83.

14) Community Relations in Superfund: A Handbook (interim version), dated 9/83.

15) "Proposal of First National Priority List," Federal Register, dated 12/30/82.

16) "Expanded Eligibility List," Federal Register, dated 7/23/82.

17) "Interim Priorities List," Federal Register, dated 10/23/81.

18) Uncontrolled Hazardous Waste Site Ranking System: A User's Manual (undated).

19) Field Standard Operating Procedures - Air Surveillance (undated).

20) Field Standard Operating Procedures - Site Safety Plan (undated).

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* Located in EPA Region III office.

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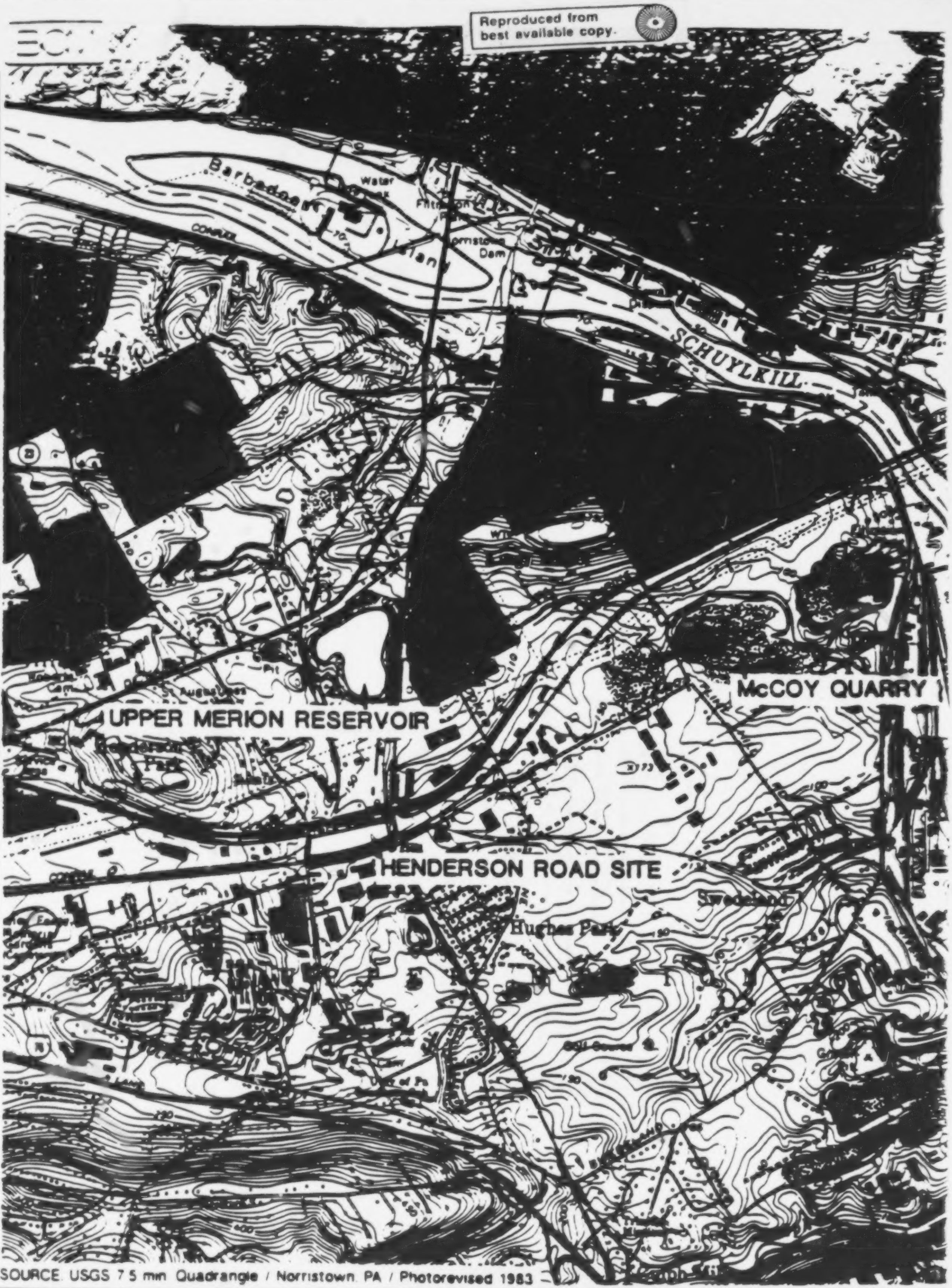

Barbadoes Island
Water Works
Norristown Dam
SCHUYLKILL
McCOY QUARRY
UPPER MERION RESERVOIR
Henderson Park
HENDERSON ROAD SITE
Swedeland
Hughes Park
Golf Course

SOURCE: USGS 7.5 min Quadrangle / Norristown, PA / Photorevised 1983

north 0 2000ft.

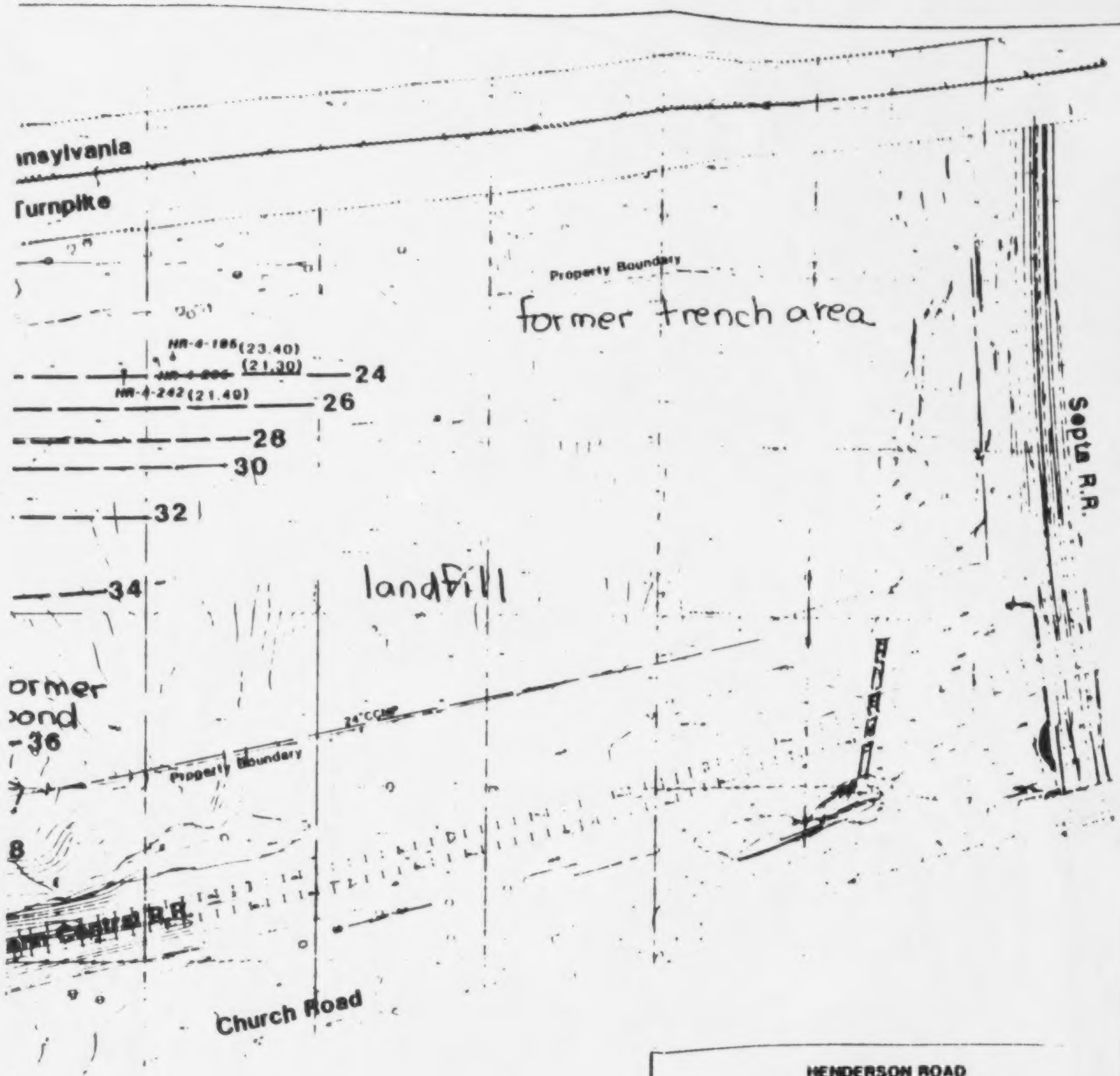
00-5528-01 and 00-5528-02

HENDERSON ROAD

King of Prussia, PA

EXHIBIT 1

60 **Location map**


insylvania
Turnpike
Septa R.R.
Property Boundary
former trench area
landfill
ormer
ond
-36
Property Boundary
24"CCMP
HR-4-186 (23.40)
(21.30)
HR-4-242 (21.40)
24
26
28
30
32
34
8
Central R.R.
Church Road

HENDERSON ROAD
REMEDIAL INVESTIGATION
King of Prussia, PA

EXHIBIT 2

Site-Specific Water Table [illegible]p
March 1986

LEGEND

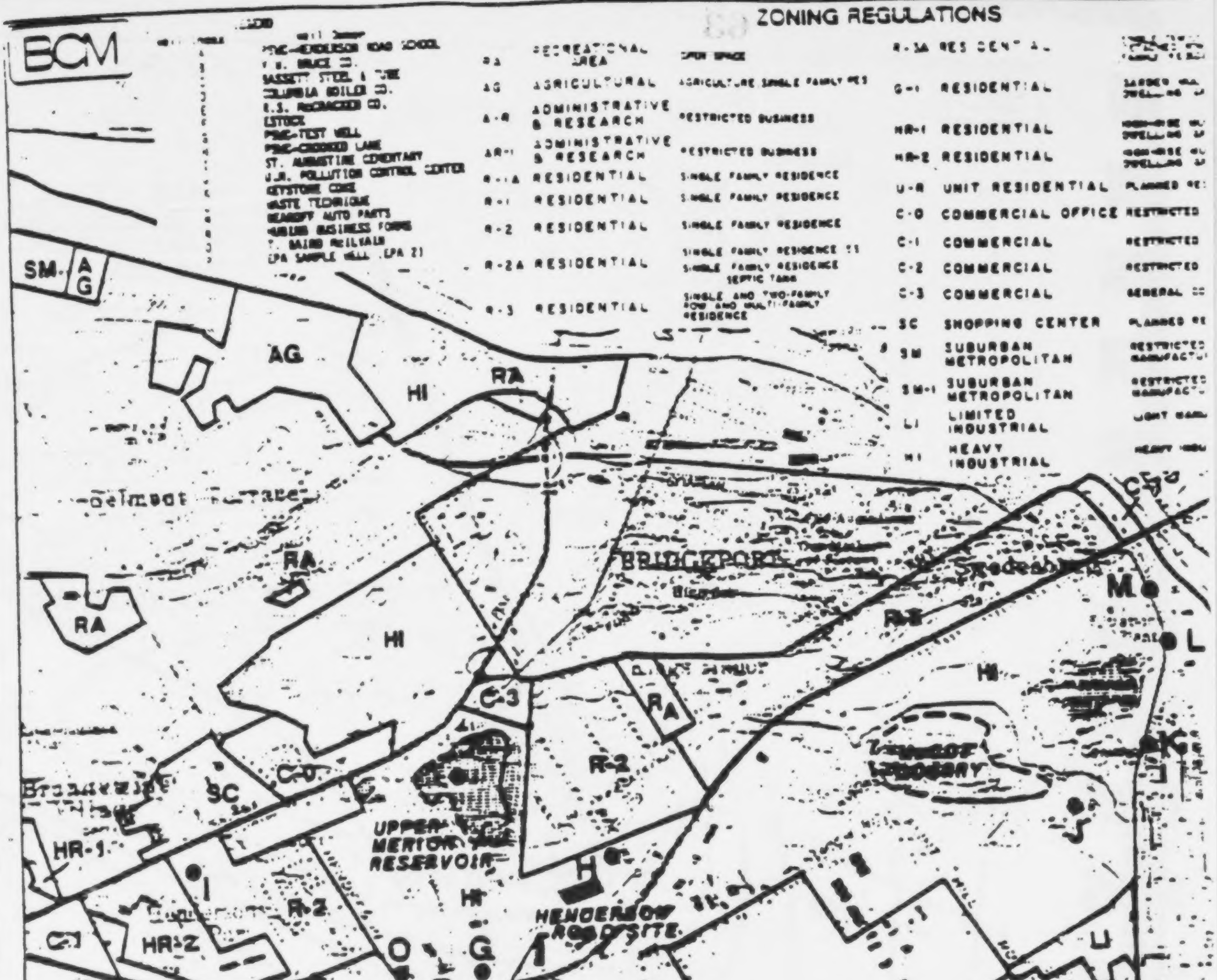
ON & NUMBER

RS CONSTRUCTED
W WELLS IN EACH

38 GROUNDWATER ELEVATION (FT., MSL)

GROUNDWATER ELEVATION CONTOUR (INFERRED).(FT., MSL)

Groundwater depths taken March 25, 1986 and March 26, 1986.


BCM
ZONING REGULATIONS
PPG-HENDERSON ROAD SCHOOL
BASSETT STEEL & TUBE
COLUMBIA BOILER CO.
PPG-TEST WELL
PPG-CROOKED LANE
ST. AUGUSTINE CONVENT
U.M. POLLUTION CONTROL CENTER
KEYSTONE COKE
WASTE TECHNIQUE
AUTO PARTS
BUSINESS FORMS
EPA SAMPLE WELL (EPA 2)
RA RECREATIONAL AREA OPEN SPACE
AG AGRICULTURAL AGRICULTURE SINGLE FAMILY RES
A-R ADMINISTRATIVE & RESEARCH RESTRICTED BUSINESS
AR-1 ADMINISTRATIVE & RESEARCH RESTRICTED BUSINESS
R-1A RESIDENTIAL SINGLE FAMILY RESIDENCE
R-1 RESIDENTIAL SINGLE FAMILY RESIDENCE
R-2 RESIDENTIAL SINGLE FAMILY RESIDENCE
R-2A RESIDENTIAL SINGLE FAMILY RESIDENCE SINGLE FAMILY RESIDENCE SEPTIC TANK
R-3 RESIDENTIAL SINGLE AND TWO-FAMILY ROW AND MULTI-FAMILY RESIDENCE
R-3A RESIDENTIAL
G-1 RESIDENTIAL GARDEN
HR-1 RESIDENTIAL HIGH-RISE DWELLING
HR-2 RESIDENTIAL HIGH-RISE DWELLING
U-R UNIT RESIDENTIAL PLANNED RE
C-O COMMERCIAL OFFICE RESTRICTED
C-1 COMMERCIAL RESTRICTED
C-2 COMMERCIAL RESTRICTED
C-3 COMMERCIAL GENERAL
SC SHOPPING CENTER PLANNED
SM SUBURBAN METROPOLITAN RESTRICTED MANUFACT
SM-1 SUBURBAN METROPOLITAN RESTRICTED MANUFACT
LI LIMITED INDUSTRIAL LIGHT MANU
HI HEAVY INDUSTRIAL HEAVY MANU
SM
AG
HI
RA
BRIDGEPORT
C-3
C-O
SC
HR-1
HR-2
R-2
R-1
R-2A
R-3
R-3A
R-1A
A-R
G-1
C-1
C-2
U
UPPER MERION RESERVOIR
HENDERSON ROAD SITE
Swedeland
M
L
K
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P
F
E
N
C
B

SOURCE: USGS 7.5 min. Quadrangle / Norristown, PA / Photorevised 1983

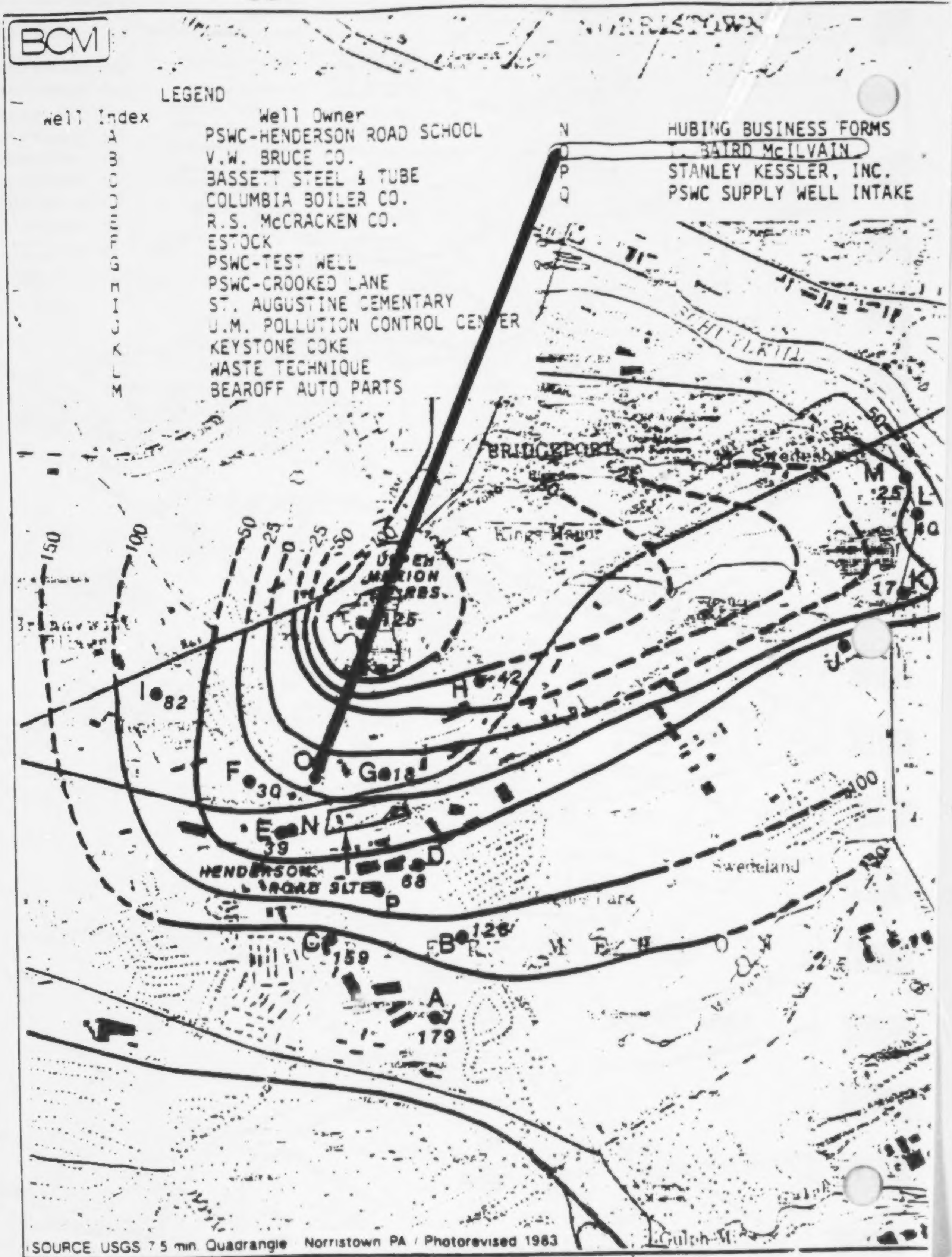
Reproduced from best available copy.

north 0 2000ft.

HENDERSON ROAD
FEASIBILITY STUDY

EXHIBIT 3

Zoning Map


BCM
NORRISTOWN
SCHUYLKILL
BRIDGEPORT
Swedesburg
Kings Manor
UPPER MERION SARBS.
Swedeland
HENDERSON ROAD SITE
I 82
H 42
G 18
F 30
O
E 39
N
D 68
P
C 159
B 126
A 179
M 25
L
K 17
J
Q
150
100
50
25
0
-25
-50
-100
-125
100
150

LEGEND

Well Index	Well Owner
A	PSWC-HENDERSON ROAD SCHOOL
B	V.W. BRUCE CO.
C	BASSETT STEEL & TUBE
D	COLUMBIA BOILER CO.
E	R.S. McCRACKEN CO.
F	ESTOCK
G	PSWC-TEST WELL
H	PSWC-CROOKED LANE
I	ST. AUGUSTINE CEMENTARY
J	U.M. POLLUTION CONTROL CENTER
K	KEYSTONE COKE
L	WASTE TECHNIQUE
M	BEAROFF AUTO PARTS
N	HUBING BUSINESS FORMS
O	J. BAIRD McILVAIN
P	STANLEY KESSLER, INC.
Q	PSWC SUPPLY WELL INTAKE

SOURCE USGS 7.5 min. Quadrangle Norristown PA / Photorevised 1983

north 0 2000ft.

HENDERSON ROAD
REMEDIAL INVESTIGATION

EXHIBIT 4

Regional Wate

EXHIBIT 5

Contaminants Identified by DER Laboratory

Sample Date:	3/22/77	4/18/77	12/19/78
Sample Description:	SKF Plant Waste Shipped to O'Hara Site	O'Hara Injection Well	O'Hara Injection Well
Constituents Found:	Dimethyl aniline Camphor Menthol Nitrobenzene Aluminum Bromide Aqueous Cyanide (Complexed with Iron) n-butyl Lithium Butyl Tosylate HCl Potassium Hydroxide Neo Pentyl Alcohol Isobutylchloroformate Urea Nitrobutane Butyl Alcohol 2-Bromobutane Carbon Tetrabomide Ferrous oxalate p-Bromoanisole	Butylcellusolve "phthalic anhydride" Phthalic acid esters Substituted aromatics Dimethyl aniline Camphor Menthol	Toluene Chlorobenzene Ethylbenzene Xylene Dichlorobenzene Methylnaphthelene Dimethylnaphthelene "Numerous unidentified hydrocarbons"

(EXHIBIT 5 CONT'D)

Comparison of Results of Testing by PJB Laboratories, Annapolis Field Office, and Sverdrup/ARO

Sample Date:	6-11-79	6-11-79	4-30-80	3-3-81
Sample No.:	790611-22	790611-22[1] (790011-22)	800501-01	C0423
Laboratory:	PJB Laboratories	Annapolis Field Office (EPA)	Annapolis Field Office (EPA)	Sverdrup/ARO. Inc.
Compound	Concentration, ppb (µg/1)[2]			
Methlyene chloride+	180	10 - 1000	10	NF(3)
Trichlorofluoromethane	10			NF
1,1-Dichloroethylene*	11	10-100(4.5)	-	NF
1,1-Dichloroethane+	3,100	1000-10,000(7800)	300	10
Trans-1,2-dichloroethylene+	830	10 - 100(10)		NF
cis-1,2-dichloroethylene+	-	- (42)	4	NF
Chloroform*	74	10 - 100(-)	30	NF
1,2-Dichloroethane*	1,800	100 - 1000(820)	200	NF
1,1,1-Trichloroethane+	120	10 - 1000(62)	10	10
1,2-Dichloropropane+	2,200	100 - 1000(580)	200	NF
Trichloroethylene*	1,200	10 - 1000	3	NF
Benzene*	810	10 - 100	80	NF
Tetrachloroethylene*	2,900	1 - 10	10	NF
Toluene+	5,200	10,000	>1,000	NF
Chlorobenzene+	1,700	10 - 100(11)	30	NF
Ethylbenzene+	6,000	100 - 1000	40	NF
1,2-Dichlorobenzene	138,000			16
1,3-Dichlorobenzene	86,000			NF
1,4-Dichlorobenzene	220,000			NF
1,2,4-Trichlorobenzene	420,000	100 - 1000		NF
Naphthalene+	152,000	1 - 10		NF
Butylbenzyl phthalate	98,000			NF
Phenol+	30,000	1 - 10		NF
4,6-Dinitro-o-cresol	110,000			NF

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* Known Carcinogen

(EXHIBIT 5 CONT'D)

Sample Date:	6-11-79	6-11-79	4-30-80	3-3-81
Sample No.:	790611-22	790611-22 (790011-22)	800501-01	C0423
Laboratory:	PJB Laboratories	Annapolis Field Office (EPA)	Annapolis Field Office (EPA)	Sverdrup/ARO. Inc.
Compound	Concentration, ppb (µg/l)$^{(2)}$			
1,2,3 - Trichloropropane				
Thiobismethane	(3)	10-100		
2-chloropropene	(3)			
Cyclohexane	(3)			
Hexane	(3)			
Methylcyclohexane	(3)			
2-Hexanone	(3)			
Ethylcylohexane	(3)			
1,3-Dimethylcyclohexane	(3)			
1,1,3-Trimethylcyclohexane	(3)			
Nonane	(3)			
5-Ethyl-2-methylheptane	(3)			
Dodecane	(3)			
Undecane	(3)			
1,5-Dimethynaphthalene	(3)	100-1000		
2,6-Dimethylundecane	(3)			
3,3-Dimethylhexane	(3)			
2,6,11-Trimethyldodecane	(3)			
Octadecane	(3)			
Bromobenzene	(3)			
4-Methyloctane	(3)			
1,4-Dimethylbenzene	(2)			
1,4-Dichlorobenzene	(2)			
1,3-Dichlorobenzene	(2)			
Hexadecanoic Acid	(2)			
1,2-Dichloroethylene		10-100		
Dimethyls[illegible]ide		[illegible]-100		
s 1-chloro-1-propene		10-100		
ethyl-2-propanone		10-100		
hyl-2-propanol				

(EXHIBIT 5 CONT'D)

Sample Date:	6-11-79	6-11-79	4-30-80	3-3-81
Sample No.:	790611-22	790611-22	800501-01	C0423
Laboratory:	PJB Laboratories	(790011-22) Annapolis Field Office (EPA)	Annapolis Field Office (EPA)	Sverdrup/ARO. Inc.
Compound	Concentration, ppb (μg/1)$^{(2)}$			
1,3-Dimethylbenzene		1000-10,000		
1,2-Dimethylbenzene		1000-10,000		
1,3,5-Trimethylbenzene		1000-10,000		
1,2,4,5-Tetramethylbenzene		1000-10,000		
1,2,3-Trichlorobenzene		1-10		
2,7-Dimethylnaphthalene		1000-10,000		
1,6,7-Trimethylnaphthelene		100-100		
2-Ethyl-1-hexanol		-		
2-Methylnaphthalene		1-10		
1,6-Dimethylnaphthalene		1-10		
2-Methylpropanoic Acid		-		
2-Methylbutanoic Acid		-		
2-Ethylbutanoic Acid		-		
2-Methylhexanoic Acid		-		
4-Methylpentanoic Acid		-		
2-Ethylheptanoic Acid		-		
2-Methyl Phenol		-		
Benzoic Acid		-		
Benzeneacetic Acid		-		
Benzenepropanoic Acid		-		
2,4,6-Trichlorophenol				NF
p-chloro-m-cresol				NF
2-Chlorophenol				NF
2,4-Dichlorophenol				NF
2,4-Dimethylphenol				NF
2-Nitrophenol				NF
4-Nitrophenol				NF
2,4-Dinitrophenol				NF
Pentachlorophenol				NF
Acenapthene				NF
Benzidine				NF

(EXHIBIT 5 CONT'D)

Sample Date:	6-11-79	6-11-79	4-30-80	3-3-81
Sample No.:	790611-22	790611-22 (790011-22)	800501-01	C0423
Laboratory:	PJB Laboratories	Annapolis Field Office (EPA)	Annapolis Field Office (EPA)	Sverdrup/ARO. Inc.
Compound	Concentration, ppb (μg/l)(2)			
Hexachloroethane				NF
bis(2-chloroethyl) ether				NF
2-Chloronaphthalene				NF
3-3-Dichlorobenzidine				NF
2,4-Dinitrotoluene				NF
2,6-Dinitrotoluene				NF
1,2-Diphenylhydrazine (as Azobenzene)				NF
Fluoranthene				NF
4-Chlorophenyl phenyl ether				NF
4-Bromophenyl phenyl ether				NF
bis(2-chloroisopropyl)ether				NF
bis(2-chloroethoxy)methane				NF
Hexachlorobutadiene				NF
Hexachlorocyclopentadiene				NF
Isophorone				NF
Nitrobenzene				NF
N-nitrosodimethylamine				NF
N-nitrosodiphenylamine				NF
N-nitrosodi-n-propylamine				NF
bis(2-ethylhexyl)phthalate				NF
di-n-butyl phthalate				NF
di-n-octyl phthalate				NF
Diethyl phthalate				NF
Dimethyl phthalate				NF
Benzo(a)anthracene				NF
Benzo(a)pyrene				NF
3,4-Benz fluoranthene				NF
Benzo(k) uoranthene				NF
hrysene				NF
enaphthylene				NF

Correspondence and Supporting Documentation

1) Letter to Mr. Charles Griffith, Pennsylvania Intergovernmental Council, from Mr. Thomas P. Eichler, U.S. EPA, re: notice of proposed Superfund Project, 8/7/84. P. 1-2.

2) Memorandum to Mr. Thomas P. Eichler, U.S. EPA, from Mr. Gene Lucero, U.S. EPA, re: recommendations to proceed with Remedial Investigation/ Feasibility Study, 9/13/84. P. 3-4. A memorandum regarding authorization to proceed with Remedial Investigation/Feasibility Study is attached.

3) Letter to Ms. Maureen Barden, U.S. EPA, from Mr. Hershel J. Richman, Cohen, Shapiro, Polisher, Skiekman and Cohen, re: transmittal of the Potentially Responsible Party position paper, 2/23/88. P. 5-25. The position paper is attached.

4) Letter to Ms. Gerallyn Downes-Valls, U.S. EPA, from Ms. Frances L. Costanzi, Pennsylvania Department of Environmental Resources, re: comments on the Remedial Investigation/Feasibility Study, 2/26/88. P. 26-35. A memorandum regarding hydrogeologic activities is attached.

5) Letter to Ms. Cindy Rice, U.S. Fish and Wildlife Service, from Mr. Steven M. Jones, BCM Eastern Inc., re: federally listed threatened and endangered species, 4/11/88. P. 36-37. A site map is attached.

6) Letter to Ms. Gerallyn Downes-Valls, U.S. EPA, from Mr. Alan Robinson, BCM, re: environmental impact, 4/14/88. P. 38-40. A letter regarding threatened or endangered species is attached.

7) Letter to Ms. Gerallyn Downes-Valls, U.S. EPA, from Ms. Debra Glover, Camp, Dresser and McKee, Inc., re: recommendations for cleanup criteria, 5/17/88. P. 41-57.

8) Letter to Ms. Maureen Barden, U.S. EPA, from Mr. Mark T. Kropilak, Philadelphia Suburban Water Company, re: response to the Remedial Investigation/Feasibility Study and proposed plan of action, 5/20/88. P. 58-61.

9) Letter to Mr. Alan Robinson, BCM Eastern, Inc., from Ms. Gerallyn Downes-Valls, U.S. EPA, re: transmittal of the "Henderson Road Injection Well Site Report on Effluent Treatment Piloting and Other Remedial Measures," 6/2/88. P. 62-91. The report is attached.

10) Letter to Mr. Alan Robinson, BCM Eastern, Inc., from Ms. Gerallyn Downes-Valls, U.S. EPA, re: transmittal of the "Henderson Road Injection Well Operable Unit Recommendations for Pre-Design Investigations Report," 6/3/88. P. 92-132. The report is attached.

11) Report: Notes on the Remedial Investigation/Feasibility Study and EPA's Plan of Action, submitted to EPA by Philadelphia Suburban Water Company, 6/3/88. P. 133-136.

12) Report: Selected ARARs for the Henderson Road Site Recommended Remedial Alternatives, prepared by the Henderson Road PRP Committee, 2/23/88. P. 190-211.

13) Report: Significant Issue Henderson Road NPL Site Injection Well Operable Unit, (no author cited), 4/88. P. 212-216.

14) Letter to Ms. Maureen Barden, U.S. EPA, from Mr. Bradford F. Whitman, Dechert, Price and Rhoads, re: comments on the proposed Remedial Plan, 5/19/88. P. 217-219.

15) Letter to Ms. Maureen Barden, U.S. EPA, from Mr. Mark J. Kropilak, Philadelphia Suburban Water Company, re: response to the Remedial Investigation/Feasibility Study and Proposed Plan of Action, 5/20/88. P. 220-223.

16) Letter to Ms. Gerallyn Downes-Valls, U.S. EPA, from Mr. Bradford F. Whitman, Dechert, Price and Rhoads, re: comments of EPA proposed Remedial Plan, 5/31/88. P. 224-238. The comment is attached.

17) Letter to Ms. Gerallyn Downes-Valls, U.S. EPA, from Mr. John P. Judge, Cohen, Shapiro, Polisher, Shiekman and Cohen, re: public comment on EPA's Proposed Plan. 6/1/88. P. 239-279. The public comment is attached.

18) Report: Henderson Road Injection Well Site Report on Additional Work on Effluent Treatment Piloting and Other Remedial Measures (no author cited), 6/2/88. P. 280-308.

19) Letter to Ms. Gerallyn Downes-Valls, U.S. EPA, from Mr. Preston Luitweilar, Philadelphia Suburban Water Company, re: estimates for the capital and operating costs of the treatment systems at the Upper Merion Treatment Plant and comments on the Remedial Investigation/Feasibility Study, 6/8/88. P. 309-317. A Cost Summary for Aeration Towers at the Upper Merion Treatment Plant and notes on the Remedial Investigation and EPA's Plan to Action are attached.

20) Letter to Mr. Bruce Smith, U.S. EPA, from Mr. Mark J. Kropilak, Philadelphia Suburban Water Company, re: contaminants found in the Upper Merion Reservoir, 6/9/88. 318-321.

21) Letter to Mr. James M. Seif, U.S. EPA, from Mr. Hershel J. Richman, Cohen, Shapiro, Polisher, Shiekman and Cohen re: recommended remedial alternatives to the Final Feasibility Study Report, 6/17/88. P. 322-326.

22) Letter to Ms. Gerallyn Downes-Valls, U.S. EPA, from Mr. Hershel J. Richman, Cohen, Shapiro, Polisher, Shiekman and Cohen, re: comments on the "Henderson Road Injection Well Operable Unit Recommendations for Pre-Desigh Investigations" report prepared by Camp, Dresser & McKee, Inc., 6/23/88. P. 327-333. The comments are attached.

EXHIBIT 6

SUMMARY OF ANALYTICAL RESULTS
ONSITE GROUNDWATER SAMPLES

HENDERSON ROAD SITE
UPPER MERION, PENNSYLVANIA

	Sample Location:	HR-1-260	HR-1-280	HR-1-276
	Sample I.D.:	N610020	N610021	N610849
	Sample Date:	05/29/86	05/29/86	06/10/86
Parameter	UNITS			
Base/Neutrals Organics				
bis(2-Ethylhexyl)phthalate	ug/l	<20.0	<20.0	9.6
Di-n-butyl phthalate	ug/l	<20.0	<20.0	3.2
Di-n-octyl phthalate	ug/l	2.8	<20.0	<20.0
N-Nitrosodiphenylamine	ug/l	<20.0	<20.0	3.8
Volatile Organics				
Benzene	ug/l	<1.0	<1.0	20.7
Chlorobenzene	ug/l	<1.0	<1.0	8.5
Chloroethane	ug/l	<1.0	<1.0	1.9
Chloroform	ug/l	<1.0	<1.0	7.8
1,1-Dichloroethane	ug/l	<1.0	1.6	18.4
1,2-Dichloroethane	ug/l	<1.0	<1.0	26.1
1,2-Dichlopropane	ug/l	<1.0	1.1	27.0
Ethylbenzene	ug/l	<1.0	10.6	29.6
Methylene chloride	ug/l	<1.0	1.0	12.9
Toluene	ug/l	2.2	35.5	126.0
1,1,1-Trichloroethane	ug/l	<1.0	<1.0	3.7
Trichloroethene (TCE)	ug/l	5.5	1.2	1.5
m-Xylene	ug/l	<1.0	22.1	49.9
p-Xylene	ug/l	<1.0	10.7	43.4

(EXHIBIT 6 CONT'D)

	Sample Location:	HR-2-175	HR-2-195	HR-2-295	HR-2-295 Dup
	Sample I.D.:	N610022	N610852	N610850	N610851
	Sample Date:	05/29/86	06/10/86	06/10/86	06/10/86
Parameter	UNITS				
Acid Extractable Organics					
Benzoic Acid	ug/l	410.0	<50,000.0	<100.0	<100.0
2,4-Dimethylphenol	ug/l	43.0	<12,000.0	4.2	5.8
Phenol	ug/l	28.0	<12,000.0	4.4	2.2
2-Methylphenol (o-Cresol)	ug/l	490.0	<12,000.0	32.0	31.0
4-Methylphenol (p-Cresol)	ug/l	330.0	<12,000.0	<20.0	<20.0
Base/Neutrals					
bis(2-Ethylhexyl) phthalate	ug/l	7.2	18,000.0	17.0	10.0
Butyl benzyl phthalate	ug/l	20.0	210,000.0	7.4	<20.0
1,2-Dichlorobenzene	ug/l	93.1	<100.0	<1.0	<1.0
1,4-Dichlorobenzene	ug/l	4.4	<100.0	<1.0	<1.0
Di-n-butyl phthalate	ug/l	<40.0	<12,000.0	2.4	2.4
Naphthalene	ug/l	9.6	<12,000.0	5.4	<20.0
Benzyl alcohol	ug/l	520.0	<12,000.0	<20.0	<20.0
4-Chloroaniline	ug/l	8.0	<12,000.0	8.2	2.2
Volatile Organics					
Benzene	ug/l	1,170.0	500.0	266.0	270.0
Chlorobenzene	ug/l	218.0	310.0	29.2	26.1
Chloroethane	ug/l	654.0	<100.0	823.0	845.0
Chloroform	ug/l	134.0	340.0	14.5	15.2
1,1-Dichloroethane	ug/l	2,980.0	1,600.0	545.0	556.0
1,2-Dichloroethane	ug/l	159.0	410.0	69.6	71.9
1,1-Dichloroethene	ug/l	36.4	<1.0	19.4	19.6
1,2-Dichloropropane	ug/l	1,460.0	1,600.0	225.0	237.0
Ethylbenzene	ug/l	2,970.0	7,800.0	138.0	138.0
Methylene chloride	ug/l	220.0	850.0	105.0	107.0
Tetrachloroethene* (PCE)	ug/l	291.0	9,800.0	8.3	8.2
Toluene	ug/l	66,600.0	246,000.0	4,200.0	1,100.0
Trans-1,2-dichloroethene	ug/l	785.0	400.0	65.3	66.8
1,1,1-Trichloroethane	ug/l	168.0	700.0	40.3	41.5
Trichloroethene (TCE)	ug/l	610.0	140.0	51.6	52.1
Trichlorofluoromethane	ug/l	<1.0	<1.0	<1.0	4.4
Vinyl chloride	ug/l	78.9	<100.0	21.7	21.8
m-Xylene	ug/l	72,000.0	37,000.0	146.0	149.0
p-Xylene	ug/l	1,300.0	19,000.0	91.0	91.3

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* 1,1,2,2-Tetrachloroethane and/or tetrachloroethene

(EXHIBIT 6 CONT'D)

	Sample Location:	HR-RE-205	HR-RE-195 Dup	HR-3-295	HR-5-192
	Sample I.D.:	N605046	N605047	N610112	N609813
	Sample Date:	03/19/86	03/19/86	05/30/86	05/27/86
Parameter	Units				
Physical Properties					
Specific Conductance	umhos/cm	790.0	803.0	NT	NT
Metals					
Arsenic	mg/l	0.004	0.003	NT	NT
Cadmium	mg/l	0.003	0.01	NT	NT
Chromium	mg/l	0.002	0.001	NT	NT
Copper	mg/l	0.04	0.04	NT	NT
Silver	mg/l	0.0006	<0.0005	NT	NT
Zinc	mg/l	0.11	0.11	NT	NT
Inorganic Non-Metallics					
Cyanide	mg/l	0.006	0.005	NT	NT
Organics					
COD	mg/l	85.0	31.0	NT	NT
Total Phenolics	mg/l	0.08	0.08	NT	NT
Acid Extractable Organics					
Benzoic Acid	ug/l	NT	NT	100.0	<100.0
2,4-Dimethylphenol	ug/l	<10.0	<10.0	19.0	<20.0
Phenol	ug/l	<10.0	<10.0	24.0	<20.0
2-Methylphenol (o-cresol)	ug/l	NT	NT	43.0	<20.0
4-Methylphenol (p-cresol)	ug/l	NT	NT	64.0	<20.0

NT - Not tested as part of this study

(EXHIBIT 6 CONT'D)

Parameter	Sample Location: Sample I.D.: Sample Date: Units	HR-RE-205 N605046 03/19/86	HR-RE-205 Dup N605047 03/19/86	HR-3-295 N610112 05/30/86	HR-5-192 N609813 05/27/86
Base/Neutral Organics					
bis(2-Ethylhexyl)phthalate	ug/l	<10.0	19.0	5.6	33.0
Butyl benzyl phthalate	ug/l	<10.0	<10.0	44.0	<20.0
1,3-Dichlorobenzene	ug/l	<10.0	<10.0	13.5	<1.0
1,4-Dichlorobenzene	ug/l	<10.0	<10.0	74.9	21.1
Naphthaline	ug/l	<10.0	<10.0	12.0	<20.0
N-Nitrosodiphenylamine	ug/l	<10.0	<10.0	4.0	<20.0
4-Chloroaniline	ug/l	NT	NT	58.0	5.0
2-Methylnaphthalene	ug/l	NT	NT	10.0	<20.0
Volatile Organics					
Benzene	ug/l	110.0	110.0	1,700.0	129.0
Chlorobenzene	ug/l	<100.0	<100.0	280.0	19.7
Chloroethane	ug/l	<100.0	<100.0	994.0	101.0
Chloroform	ug/l	<100.0	<100.0	433.0	<1.0
1,1-Dichloroethane	ug/l	2,000.0	2,000.0	1,120.0	15.9
1,2-Dichloroethane	ug/l	74.0	76.0	297.0	<1.0
1,1-Dichloroethene	ug/l	<100.0	<100.0	102.0	4.2
1,2-Dichloropropane	ug/l	120.0	120.0	1,800.0	<1.0
Ethylbenzene	ug/l	110.0	100.0	6,500.0	25.1
Methylene chloride	ug/l	<100.0	55.0	614.0	3.6
Tetrachloroethene (PCE)	ug/l	<100.0	<100.0	86.0	4.8
Toluene	ug/l	2,700.0	2,700.0	27,000.0	258.0
Trans-1,2-Dichloroethene	ug/l	<100.0	<100.0	40.8	1.2
1,1,1-Trichloroethane	ug/l	220.0	230.0	1,200.0	1.2
Trichloroethene (TCE)	ug/l	<100.0	<100.0	18.4	1.4
Trichlorofluoromethane	ug/l	NT	NT	95.3	<1.0
Vinyl chloride	ug/l	73.0	78.0	36.4	<1.0
m-Xylene	ug/l	NT	NT	10,000.0	21.1
p-Xylene	ug/l	NT	NT	8,000.0	17.9

NT - Not tested as part of this study

(EXHIBIT 6 CONT'D)

Parameter	Sample Location:	Trip Blank	Field Blank	Trip Blank	Field Blank
	Sample I.D.:	N605049	N605048	N609917	N609918
	Sample Date:	03/19/86	03/19/86	05/28/86	05/28/86
	Units				
Physical Properties					
Specific Conductance	umhos/cm	3.69	4.12	NT	NT
Metals					
Lead	mg/l	0.002	<0.002	NT	NT
Silver	mg/l	0.0006	0.001	NT	NT
Zinc	mg/l	0.01	<0.01	NT	NT
Organics					
Total Phenolics	mg/l	<0.002	0.003	NT	NT
Base/Neutral Organics					
bis(2-Ethylhexyl)phthalate	ug/l	10.0	22.0	<40.0	<20.0
Volatile Organics					
Chloroform	ug/l	82.0	78.0	3.2	<1.0
Toluene	ug/l	<10.0	<10.0	2.9	2.9

NT - Not tested as part of this study

Source: BCM Eastern Inc. (BCM Project Nos. 00-5528-02 and 00-5528-03)

(EXHIBIT 6 CONT'D)

Parameter	UNITS	HR-4-195	HR-4-242	HR-4-295
Sample Location:		HR-4-195	HR-4-242	HR-4-295
Sample I.D.:		N609814	N605044	N605045
Sample Date:		C5/27/86	03/19/86	03/19/86
Physical Properties				
Specific Conductance	umhos/cm	NT	1,220.0	1,180.0
Metals				
Arsenic	mg/l	NT	<0.002	0.003
Cadmium	mg/l	NT	0.003	0.003
Chromium	mg/l	NT	0.004	0.002
Copper	mg/l	NT	0.04	0.04
Lead	mg/l	NT	0.002	0.002
Silver	mg/l	NT	0.0006	0.002
Zinc	mg/l	NT	6.54	5.92
Inorganic Non-Metallics				
Cyanide	mg/l	NT	0.01	<0.005
Organics				
COD	mg/l	NT	121.0	134.0
Total Phenolics	mg/l	NT	0.02	0.03
Base/Neutral Organics				
bis(2-Ethylhexyl)phthalate	ug/l	<20.0	14.0	29.0
1,2-Dichlorobenzene	ug/l	26.1	<10.0	<10.0
Volatile Organics				
Benzene	ug/l	142.0	530.0	370.0
Chlorobenzene	ug/l	13.9	74.0	36.0
Chloroethane	ug/l	354.0	2,100.0	1,200.0
1,1-Dichloroethane	ug/l	143.0	360.0	270.0
1,2-Dichloroethane	ug/l	8.2	62.0	30.0
1,1-Dichloroethene	ug/l	5.7	<45.0	<45.0
1,2-Dichloropropane	ug/l	17.6	67.0	33.0
Ethylbenzene	ug/l	37.6	580.0	320.0
Methylene chloride	ug/l	10.2	84.0	44.0
Tetrachloroethene* (PCE)	ug/l	10.9	<45.0	<45.0
Toluene	ug/l	7.2	6,400.0	1,400.0
Trans-1,2-dichloroethene	ug/l	188.0	31.0	41.0
1,1,1-Trichloroethane	ug/l	25.8	<45.0	<45.0
Trichloroethene (TCE)	ug/l	92.0	29.0	35.0
Vinyl chloride	ug/l	100.0	<45.0	<45.0
m-Xylene	ug/l	11.0	NT	NT
p-Xylene	ug/l	22.9	NT	NT

NT - Not tested as part of this study

* 1,1,2,2-Tetrachloroethane and/or tetrachloroethene

EXHIBIT 7

SPLIT SAMPLE RESULTS

HENDERSON ROAD SITE
UPPER MERION, PENNSYLVANIA

Sample Location:	HR-RE-205		HR-4-242		HR-4-295		HR-5-192		HR-2-175*		PSWC Crooked Lane		Quarry/UMR	
Sample I.D.:	N605046	CE231	N60544	CE213	N605045	CE230	N609813	860602-01	N610022	860602-06	N609919	860602-03	N609916	860602 02
Sample Date:	3/19/86	3/19/86	3/19/86	3/19/86	3/19/86	3/19/86	5/27/86	5/27/86	5/29/86	5/29/87	5/28/86	5/28/86	5/28/86	5/28/87
arameter (ug/l)														
olatiles														
enzene	110	100	530	380	370	340	129	75	1,170	1,300 J	<1	ND	<1	ND
hlorobenzene	<100	ND	74	ND	36	ND	19.7	15.5	218	200 J	3.0	0.4 J	<1	ND
hloroethane	<100	80 J	2,100	1,800	1,200	840	101	90	654	960 J	3.9	4.3 J	<1	0.6 J
1,1 Dichloroethane	2,000	1,540	360	260	270	220	15.9	12.0	2,980	3,000 J	<1	3.1 J	<1	1.2 J
1,2 Dichloroethane	74	ND	62	ND	30	ND	<1.0	ND	159	ND	<1	ND	<1	ND
1,1 Dichloroethene	<100	ND	<45	ND	<45	ND	4.2	ND	36.4	ND	3.4	0.2 J	<1	0.2 J
1,2 Dichloropropane	120	120	67	ND	33	ND	<1.0	ND	1,460	1,200 J	<1	ND	<1	ND
thylbenenzene	110	120	580	480	320	300	25.1	14.5	2,970	2,000 J	<1	ND	13.3	ND
ethylene Chloride	<100	ND	84	80 VFA	44	40 VFA	3.6	ND	220	ND	1.5	ND	3.3	ND
etrachloroethene	<100	ND	<45	ND	<45	ND	4.8	4.7 J	291	300 J	28.3	0.3 J	3.6	1.1 J
oluene	2,700	2,340	6,400	4,000	1,400	1,320	258	165	66,600	57,000	2.7 A	ND	2.9 A	ND
rans 1,2-Dichloroethene	<100	40 J	31	ND	41	40 J	1.2	0.6 J	785	ND	6.0	ND	<1	ND
1,1,1-Trichloroethane	220	200	<45	ND	<45	ND	1.2	3.1 J	168	ND	<1	ND	4.5	0.7 J
richloroethene	<100	ND	29	30 JA	35	30 JA	1.4	1.6 J	610	ND	44	40	12.9	13 8
inyl Chloride	73	80 J	<45	ND	<45	30 J	<1.0	0.9 J	78.9	ND	<1	ND	<1	ND
-Xylene	NT		NT		NT		21.1	16.0	72,000	8,000	<1	ND	<	ND
-Xylene	NT		NT		NT		17.9	4.5 J	1,300	2,000 J	<1	ND	<1	ND
otal Xylenes		340		1,000		400								
hloroform								20.0 J						
arbon Disulfide								2.3 J						
ase/Neutrals and Acid Extractables														
1,2 Dichlorobenzene	ND	7.0 J	<10	ND	<10	3.0 J	<1.0	0.5 J	93.1	10 J	ND	ND	ND	ND
enzyl Alcohol	NT	400 F	NT		NT	ND		ND	520	4,400	ND	ND	NT	ND
enzoic Acid	NT	32 F	NT		NT	25 J	<100	0.2 J	410	1,240	ND	ND	ND	ND
aphthalene	<10	8 J	<10	9 J	<10	8 J	<20	ND	9.6	13 J	ND	ND	ND	ND
utyl Benzyl Phthalate	<10		<1J		<10		<20	ND	20	54				
i n butylphthalate	<10	7 VFA	<10	8 VFA	<10	6 VFA	<20	ND	<40	ND	ND	ND	ND	ND
is(2 ethylehexyl) Phthalate	19 A	37 VFA	14 A	80 VFA	29 A	40 VFA	33	45	7.2		ND	ND	ND	ND

(EXHIBIT 7 CONT'D)

Sample Location:	HR-RE-205		HR-4-242		HR-4-295		HR-5-192		HR-2-175		PSWC Crooked Lane		Quarry/UMR	
Sample I.D.:	N605046	CE231	N60544	CE213	N605045	CE230	N609813	860602-01	N610022	860602-06	N609919	860602-03	N609916	860602-02
pound / Sample Date:	3/19/86	3/19/86	3/19/86	3/19/86	3/19/86	3/19/86	5/27/86	5/27/86	5/29/86	5/29/87	5/28/86	5/28/86	5/28/86	5/28/87
atiles														
line		ND	NT	205	NT	ND	ND		ND	ND	ND	ND	ND	ND
hloroaniline	NT		NT		NT		5	1.1 J	8	ND	ND	ND	ND	ND
ethyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	800 J	ND	ND	ND	ND
ethylphenol	NT	110 F	NT	13 F	NT	10	<20	1.2 J	490	540	<20	ND	NT	ND
ethylphenol	NT	24 F	NT		NT	ND	<20	NT	330	620	<20	ND	NT	ND
Dimethylphenol	ND	28 F	<10	11 F	<10	4 J	<20	NT	43	114	<20	ND	NT	ND
ol	ND		<10			ND	<20	ND	28	72	<20	ND	ND	ND
Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	4.4	6.5 J	ND	ND	ND	ND
Dichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.1 J	ND	ND	ND	ND
anthrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	ND	ND	ND	ND
-octyl Phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.7	ND	ND	ND	ND

le number/lab identification:

N prefix - BCM or BCM subcontractor (CompuChem)
Ct prefix - Lab not identified - EPA lab, EPA contractor
No letters in prefix - NUS Corporation for EPA

Some EPA reports list Sample 860602-06 as from Well HR-2-195. As HR-2-105 was sampled on 6/10/86, not 5/29/86, it is understood that the HR-2-195 designation was either incorrectly recorded or is a typographical error

This concentration reported by laboratory, but evidence exists to doubt presence of compound (may or may not be present)
Estimated value; presence of compound is indicated, but the response is less than the quantification limit
The associated numerical value is an estimated quantity because quality criteria were not met
The material was analyzed for, but not detected; the associated numberical value is the estimated sample quantification limit
Not detected
Not tested

es: BCM Eastern Inc.
USEPA TDD No. F3-8511-02, Lab Case 5749
NUS Corporation - August 3, 1986, letter from Marcia Lynn Case (NUS) to Harold Byer, EPA re. TDDN F3-8511-02

led By: BCM Eastern Inc. (BCM Project Nos. 00-5528-01 and 00-5528-02)

EXHIBIT 6

SUMMARY OF ANALYTICAL RESULTS
OFFSITE GROUNDWATER SAMPLES

HENDERSON ROAD SITE
UPPER MERION, PENNSYLVANIA

Sample Location: Sample I.D.: Sample Date: Parameter (units)	Hubing N609810 05/27/86	Estock N609811 05/27/86	McIlvain N609812 05/27/86	Quarry N609916 05/28/86
Metals (mg/l)				
Antimony	NT	NT	NT	0.004
Arsenic	NT	NT	NT	0.007
Copper	NT	NT	NT	0.02
Zinc	NT	NT	NT	0.13
Total Phenolics (mg/l)	NT	NT	NT	0.13
Volatile Organics (ug/l)				
Benzene	3.9	<1.0	<1.0	<1.0
Chlorobenzene	7.4	<1.0	4.7	3.2
Chloroethane	2.5	<1.0	4.9	<1.0
1,1-Dichloroethane	3.3	<1.0	13.1	<1.0
1,2-Dichloroethane	<1.0	<1.0	2.3	<1.0
1,1-Dichloroethene	6.9	<1.0	<1.0	<1.0
1,2-Dichloropropane	<1.0	1.3	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	13.3
Methylene chloride	1.8	1.9	1.9	3.3
Tetrachloroethene (PCE)*	4.2	<1.0	<1.0	3.6
Toluene	2.6	2.9	2.2	2.9
Trans-1,2-dichloroethene	1.1	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	150.0	<1.0	<1.0	4.5
Trichloroethene (TCE)	120.0	<1.0	1.1	12.9

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* 1,1,2,2-Tetrachloroethane and/or tetrachloroethene

NT - Not tested as part of this study

(EXHIBIT 8 CONT'D)

Sample Location: Sample I.D.: Sample Date: Parameter (units)	PSWCL N609919 05/28/86	PSWAP N609920 05/28/86	Trip Blank N609917 05/28/86	Field Blank N609918 05/28/86
Volatile Organics (ug/l)				
Chlorobenzene	3.0	<1.0	<1.0	<1.0
Chloroethane	3.9	<1.0	<1.0	<1.0
Chloroform	<1.0	<1.0	3.2	<1.0
1,1-Dichloroethane	3.4	<1.0	<1.0	<1.0
Methylene chloride	1.5	<1.0	<1.0	<1.0
Tetrachloroethene* (PCE)	28.3	1.1	<1.0	<1.0
Toluene	2.7	23.04	2.9	2.9
Trans-1,2-dichloroethene	6.0	<1.0	<1.0	<1.0
Trichloroethene (TCE)	44.0	1.1	<1.0	<1.0

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* 1,1,2,2-Tetrachloroethane and/or tetrachloroethene

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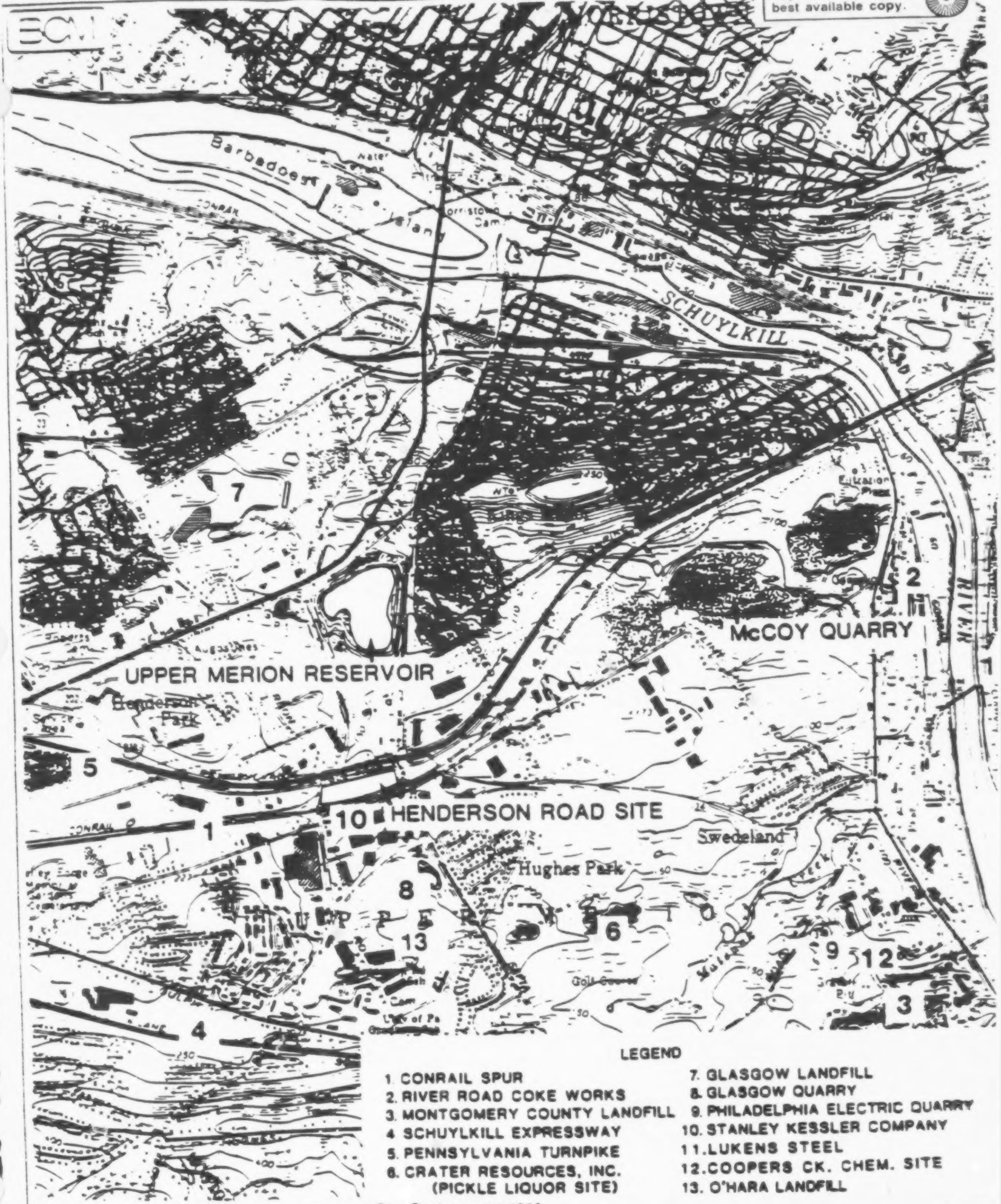
BCM
Barbadoes Island
SCHUYLKILL
RIVER
CONRAIL
7
2
McCOY QUARRY
UPPER MERION RESERVOIR
Henderson Park
5
1
10
HENDERSON ROAD SITE
Swedeland
Hughes Park
8
13
6
9
12
3
4
Golf Course

LEGEND

1. CONRAIL SPUR
2. RIVER ROAD COKE WORKS
3. MONTGOMERY COUNTY LANDFILL
4. SCHUYLKILL EXPRESSWAY
5. PENNSYLVANIA TURNPIKE
6. CRATER RESOURCES, INC. (PICKLE LIQUOR SITE)
7. GLASGOW LANDFILL
8. GLASGOW QUARRY
9. PHILADELPHIA ELECTRIC QUARRY
10. STANLEY KESSLER COMPANY
11. LUKENS STEEL
12. COOPERS CK. CHEM. SITE
13. O'HARA LANDFILL

SOURCE USGS 7.5 min Quadrangle Norristown PA Photorevised 1983

north 0 2000ft.

00-5528-01 and 00-5528-02

HENDERSON ROAD
REMEDIAL INVESTIGATION
King of Prussia, PA

EXHIBIT 9
Land Use & Potential
Groundwater Contaminati
Sources

EXHIBIT 10
CHEMICALS OF CONCERN

HENDERSON ROAD SITE
UPPER MERION, PENNSYLVANIA

Benzene
Benzoic Acid
Benzyl Alchohol
Bis(2-Ethylhexyl) Phthalate
Butyl Benzyl Phthalate
4-Chloroaniline
Chlorobenzene
Chloroform
1,4-Dichlorobenzene
1,1-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethane
1,2-Dichloroethene (trans)
1,2-Dichloropropane
2,4-Dimethylphenol
Di-n-butyl Phthalate
Ethylbenzene
Methylene Chloride
2-Methylphenol
4-Methylphenol
Naphthalene
N-nitrosodiphenylamine
Phenol
Tetrachloroethene (PCE)
Toluene
1,1,1-Trichloroethane (TCE)
Vinyl Chloride
m-Xylene
p-Xylene
Carbon Tetrachloride #
Dibromochloromethane #
Dichlorobromomethane #
Cadmium ##
Copper ##
Zinc ##

# Included on the basis of detection limits. Not detected in samples from the site.
## Included on the basis of criteria for aquatic life.

Source: BCM Eastern Inc. (BCM Project No. 00-5528-02)

EXHIBIT 11

SUMMARY OF CANCER RISK FACTORS AND HAZARD INDICES

HENDERSON ROAD SITE
UPPER MERION, PENNSYLVANIA

Model	Description	CRF	HI
Scenario I:	Based on a hypothetical sample using aggregate maximum concentrations (including HR-2-195) from Site wells (i.e., data do not represent an actual sample)		
Model 1:	Direct ingestion of hypothetical sample	36,284	385.6
Model 2:	Simulated incorporation into the UMR of hypothetical sample	1,091	11.6
Model 3:	Simulated incorporation into the UMR of the hypothetical sample for all chemicals of concern added to aggregate maximum concentrations found in the UMR	1,277	13.7
Model 4:	Simulated incorporation into the UMR of Site chemicals not found in the UMR and maximum concentrations found in the UMR	188.6	2.9
Scenario II:	Based on a hypothetical sample using average concentrations from Site wells (without HR-2-195 or HR-5-192)		
Model 5:	Simulated incorporation into the UMR for all chemicals of concern	257.5	3.1
Scenario III:	Based on concentrations of chemicals found in untreated UMR water. Aggregate maximum values compiled from all data		
Model 6:	Maximum concentrations in untreated UMR water for chemicals of concern	187.4	2.2
Model 7:	Average concentrations in untreated UMR water for chemicals of concern	75.8	0.6

(EXHIBIT 12 CONT'D)

Model	Description	CRF	HI
Model 8:	Maximum concentrations in untreated UMR water for all chemicals found in the UMR	228.0	2.3
Model 9:	Average concentrations in untreated UMR water for all chemicals found in the UMR	86.6	0.6
Scenario IV:	Based on concentrations of chemicals found in treated UMR water. Aggregate maximum values used.		
Model 10:	Maximum concentrations in treated UMR water for chemicals of concern	19.2	1.5
Model 11:	Average concentrations in treated UMR water for chemicals of concern	6.2	0.7
Model 12:	Maximum concentrations in treated UMR water for all chemicals found in the UMR	44.0	1.5
Model 13:	Average concentrations in treated UMR water for all chemicals found in the UMR	18.7	0.7
McIlvain Well Water		6.8	0.009

CFR = Probability of cancer incidence in a population of 1,000,000 people
HI = Hazard index

Source: BCM Eastern Inc. (BCM Project No. 00-5528-02)

EXHIBIT 12

CARCINOGENIC RISK ASSESSMENT

HENDERSON ROAD SITE
UPPER MERION, PENNSYLVANIA

Chemical	Model 1		Model 2		Model 3		Model 4		Model 5	
	Exposure Models based on Concentrations at Site									
	CRF	Percent	CRF	Percent	CRF	Percent	CRF	Percent	CRF	Percent
Carcinogens Found Only at Site										
Bis(2-Ethylhexyl) Phthalate	6.64	0.0	0.20	0.0	0.20	0.0	0.20	0.1	0.01	0.0
4-Chloroaniline	31.49	0.1	0.92	0.1	0.92	0.1	0.92	0.5	0.38	0.1
N-Nitrosodiphenylamine	5.60	0.0	0.17	0.0	0.17	0.0	0.17	0.1	0.07	0.0
Carcinogens Found at Site and UMR										
Benzene	2,525.71	7.0	75.77	6.9	76.51	6.0	0.74	0.4	27.34	10.7
Chloroform	1,002.09	2.8	31.98	2.9	82.85	6.5	52.77	28.0	7.64	3.0
1,1-Dichloroethane	7,748.00	21.4	232.44	21.3	235.04	18.4	2.60	1.4	62.66	24.4
1,2-Dichloroethane	1,066.00	2.9	31.90	2.9	32.50	2.5	0.52	0.3	7.80	3.0
1,1-Dichloroethene	1,690.29	4.7	51.37	4.7	59.66	4.7	8.29	4.4	24.86	9.7
Methylene Chloride	182.14	0.5	5.46	0.5	6.17	0.5	0.71	0.4	1.05	0.4
Tetrachloroethene	14,280.00	39.4	428.40	39.3	433.79	34.0	5.39	2.9	3.64	1.4
Trichloroethene	191.71	0.5	5.75	0.5	9.81	0.8	4.05	2.1	1.26	0.5
Vinyl Chloride	6,571.43	18.1	197.14	18.1	262.86	20.6	65.71	34.8	111.71	43.5
Carbon Tetrachloride#	371.43	1.0	11.14	1.0	14.86	1.2	3.71	2.0	3.09	1.2
Dichlorobromomethane#	371.43	1.0	11.14	1.0	47.54	3.7	36.40	19.3	3.09	1.2
Dibromochloromethane#	240.00	0.7	7.2	0.7	13.68	1.1	6.48	3.4	1.99	0.8
Total Cancer Risk Factor (Per 1,000,000 People)	36,283.96		1,090.98		1,276.55		188.66		256.59	

(EXHIBIT 12 CONT'D)

Chemical	Exposure Models based on Data for Upper Merion Reservoir															
	Untreated UMR Water								Treated UMR Water							
	Model 6		Model 7		Model 8		Model 9		Model 10		Model 11		Model 12		Model 13	
	CRF	Percent	CRF	Percent	CRF	Percent	CRF	Percent	CRF	Percent	CRF	Percent	CRF	Percent	CRF	Percent
Carcinogens Found at Site and UMR																
Benzene	0.74	0.4	0.74	1.0	0.74	0.3	0.74	0.9	0.74	3.9	0.74	12.0	0.74	1.7	0.74	4.0
Chloroform	52.77	28.1	1.39	1.8	52.77	23.1	1.39	1.6	2.55	13.3	0.69	11.2	2.55	5.8	0.69	3.7
1,1 Dichloroethane	2.60	1.4	1.30	1.7	2.60	1.1	1.30	1.5	1.56	8.1	0.52	8.4	1.56	3.5	0.52	2.8
1,2 Dichloroethane	0.52	0.3	0.26	0.3	0.52	0.2	0.26	0.3	2.08	10.8	0.26	4.2	2.08	4.7	0.26	1.4
1,1-Dichloroethene	8.29	4.4	1.66	2.2	8.29	3.6	1.66	1.9	4.97	25.9	1.66	26.8	4.97	11.3	1.66	8.8
Methylene Chloride	0.71	0.4	0.02	0.0	0.71	0.3	0.02	0.0	0.09	0.5	0.02	0.3	0.09	0.2	0.02	0.1
Tetrachloroethene	5.39	2.9	1.17	1.5	5.39	2.4	1.17	1.3	0.44	2.3	0.15	2.4	0.44	1.0	0.15	0.8
Trichloroethene	4.05	2.2	2.11	2.8	4.05	1.8	2.11	2.4	1.95	10.1	0.50	8.1	1.95	4.4	0.50	2.7
Vinyl Chloride	65.71	35.1	65.71	86.7	65.71	28.8	65.71	75.9	0.65	3.4	0.65	10.5	0.65	1.5	0.65	3.5
Carbon Tetrachloride#	3.71	2.0	0.37	0.5	3.71	1.6	0.37	0.2	2.97	15.5	0.37	0.2	2.97	6.8	0.37	2.0
Dichlorobromomethane#	36.40	19.4	0.74	1.0	36.40	16.0	0.74	0.4	0.74	3.9	0.37	0.2	0.37	0.8	0.37	2.0
Dibromochloromethane#	6.48	3.5	0.24	0.3	6.48	2.8	0.24	0.1	0.48	2.5	0.24	0.1	0.48	1.1	0.24	1.3
Carcinogens Found Only at UMR																
1,1,2,2-Tetrachlorethane	0.00	0.0	0.00	0.0	6.29	2.8	0.57	0.7	0.00	0.0	0.00	0	0.57	1.3	0.57	3.0
1,2,3-Trichloropropane	0.00	0.0	0.00	0.0	34.29	15.0	10.29	11.9	0.00	0.0	0.00	0	24.57	55.9	12.00	64.0
Total Cancer Risk Factor (Per 1,000,000 People)	187.47		75.80		227.95		86.57		19.22		6.17		43.99		18.74	

Chemicals not found in site-related samples. Risk calculations based on detection limits.

Source: BCM Eastern Inc. (Project No. 00 5528-02)

EXHIBIT 13

HAZARD INDEX (HI) FOR CHEMICALS WITH NON-CARCINOGENIC EFFECTS

HENDERSON ROAD SITE
UPPER MERION, PENNSYLVANIA

Chemical	Model 1		Model 2		Model 3	
	HI	Percent	HI	Percent	HI	Percent
Chemicals with Non-carcinogenic Effects Found Only at Site						
Benzoic Acid	0.5857	0.2	0.0176	0.2	0.0176	0.1
Benzyl alcohol	1.4857	0.4	0.0429	0.6	0.0429	0.3
Bis(2-Ethylhexyl) Phthalate	0.4857	0.1	0.0146	0.1	0.0146	0.1
Butyl Benzyl Phthalate	3.3416	0.9	0.1002	0.9	0.1002	0.7
4-Chloroaniline	1.6571	0.4	0.0486	0.4	0.0486	0.4
2,4-Dimethylphenol	0.1117	0.0	0.0034	0.0	0.0034	0.0
Di-n-butyl Phthalate	0.0519	0.0	0.0016	0.0	0.0016	0.0
2-Methylnaphthalene	0.0229	0.0	0.0007	0.0	0.0003	0.0
2-Methylphenol	11.6600	3.0	0.3500	3.0	0.3500	2.6
4-Methylphenol	4.7143	1.2	0.1414	1.2	0.1414	1.0
Naphthalene	0.0014	0.0	0.0000	0.0	0.0000	0.0
Phenol	0.0200	0.0	0.0006	0.0	0.0006	0.0
m-Xylene	1.0286	0.3	0.0309	0.3	0.0309	0.2
p-Xylene	0.2714	0.1	0.0081	0.1	0.0081	0.1
Chemicals with Non-carcinogenic Effects Found at Site and UMR						
Chlorobenzene	0.3280	0.1	0.0098	0.1	0.0132	0.1
Chloroform	1.2371	0.3	0.0371	0.3	0.1023	0.7
1,4-Dichlorobenzene	1.0700	0.3	0.0314	0.3	0.0320	0.2
1,1-Dichloroethane	0.7095	0.2	0.0213	0.2	0.0215	0.2
1,1-Dichloroethene	0.3238	0.1	0.0098	0.1	0.0114	0.1
1,2-Dichloroethene (trans)	11.2143	2.9	0.3371	2.9	0.3443	2.5
1,2-Dichloropropane	300.7519	78.0	9.0225	78.0	11.0276	80.5
Ethylbenzene	2.2286	0.6	0.0669	0.6	0.0707	0.5
Methylene Chloride	0.4048	0.1	0.0121	0.1	0.0137	0.1
Tetrachloroethene	14.0000	3.6	0.4200	3.6	0.4253	3.1
Toluene	23.4286	6.1	0.7029	6.1	0.7033	5.1
1,1,1-Trichloroethane	0.3987	0.1	0.0120	0.1	0.0137	0.1
Carbon Tetrachloride#	4.0816	1.1	0.1224	1.1	0.1633	1.2
TOTAL HAZARD INDEX*	385.6150		11.5659		13.7023	

(EXHIBIT 13 CONT'D)

Chemical	Model 4		Model 5		Model 6	
	HI	Percent	HI	Percent	HI	Percent
Chemicals with Non-carcinogenic Effects Found Only at Site						
Benzoic Acid	0.0176	0.6	0.0076	0.2	0.0000	0.0
Benzyl alcohol	0.0429	1.5	0.0126	0.4	0.0000	0.0
Bis(2-Ethylhexyl) Phthalate	0.0146	0.5	0.0007	0.0	0.0000	0.0
Butyl Benzyl Phthalate	0.1002	3.5	0.0006	0.0	0.0000	0.0
4-Chloroaniline	0.0486	1.7	0.0200	0.6	0.0000	0.0
2,4-Dimethylphenol	0.0034	0.1	0.0013	0.0	0.0000	0.0
Di-n-butyl Phthalate	0.0016	0.1	0.0006	0.0	0.0000	0.0
2-Methylnaphthalene	0.0007	0.0	0.0004	0.0	0.0000	0.0
2-Methylphenol	0.3500	12.1	0.1257	4.0	0.0000	0.0
4-Methylphenol	0.1614	4.9	0.0471	1.5	0.0000	0.0
Naphthalene	0.0000	0.0	0.0000	0.0	0.0000	0.0
Phenol	0.0006	0.0	0.0004	0.0	0.0000	0.0
m-Xylene	0.0309	1.1	0.0088	0.3	0.0000	0.0
p-Xylene	0.0081	0.3	0.0010	0.0	0.0000	0.0
Chemicals with Non-carcinogenic Effects Found at Site and UMR						
Chlorobenzene	0.0034	0.1	0.0034	0.1	0.0034	0.2
Chloroform	0.0651	2.2	0.0146	0.5	0.0651	3.0
1,4-Dichlorobenzene	0.0006	0.0	0.0071	0.2	0.0006	0.0
1,1-Dichloroethane	0.0002	0.0	0.0058	0.2	0.0002	0.0
1,1-Dichloroethene	0.0016	0.1	0.0048	0.2	0.0016	0.1
Trans-1,2-Dichloroethene	0.0071	0.2	0.0771	2.5	0.0714	3.2
1,2-Dichloropropane	2.0050	69.2	2.6734	85.9	2.0050	91.1
Ethylbenzene	0.0038	0.1	0.0131	0.4	0.0038	0.2
Methylene Chloride	0.0016	0.1	0.0023	0.1	0.0016	0.1
Tetrachloroethene	0.0053	0.2	0.0036	0.1	0.0053	0.2
Toluene	0.0004	0.0	0.0442	1.4	0.0004	0.0
1,1,1-Trichloroethane	0.0017	0.1	0.0025	0.1	0.0017	0.1
Carbon Tetrachloride#	0.0408	1.4	0.0327	1.0	0.0408	1.9
TOTAL HAZARD INDEX*	2.8972		3.1116		2.2009	

(EXHIBIT 13 CONT'D)

Chemical	Model 7		Model 10		Model 11		McIlvain	
	HI	Percent	HI	Percent	HI	Percent	HI	Percent
Chemicals with Non-carcinogenic Effects Found Only at Site								
Benzoic Acid	0.0000	0.0	0.0000	0.0	0.0000	0.0	0.0000	0.0
Benzyl alcohol	0.0000	0.0	0.0000	0.0	0.0000	0.0	0.0000	0.0
Bis(2-Ethylhexyl) Phthalate	0.0000	0.0	0.0000	0.0	0.0000	0.0	0.0000	0.0
Butyl Benzyl Phthalate	0.0000	0.0	0.0000	0.0	0.0000	0.0	0.0000	0.0
4-Chloroaniline	0.0000	0.0	0.0000	0.0	0.0000	0.0	0.0000	0.0
2,4-Dimethylphenol	0.0000	0.0	0.0000	0.0	0.0000	0.0	0.0000	0.0
Di-n-butyl Phthalate	0.0000	0.0	0.0000	0.0	0.0000	0.0	0.0000	0.0
2-Methylnaphthalene	0.0000	0.0	0.0000	0.0	0.0000	0.0	0.0000	0.0
2-Methylphenol	0.0000	0.0	0.0000	0.0	0.0000	0.0	0.0000	0.0
4-Methylphenol	0.0000	0.0	0.0000	0.0	0.0000	0.0	0.0000	0.0
Naphthalene	0.0000	0.0	0.0000	0.0	0.0000	0.0	0.0000	0.0
Phenol	0.0000	0.0	0.0000	0.0	0.0000	0.0	0.0000	0.0
m-Xylene	0.0000	0.0	0.0000	0.0	0.0000	0.0	0.0000	0.0
p-Xylene	0.0000	0.0	0.0000	0.0	0.0000	0.0	0.0000	0.0
Chemicals with Non-carcinogenic Effects Found at Site and UMR								
Chlorobenzene	0.0005	0.1	0.0005	0.0	0.0005	0.1	0.0050	55.3
Chloroform	0.0017	0.3	0.0031	0.2	0.0009	0.1	0.0000	0.0
1,4-Dichlorobenzene	0.0006	0.1	0.0004	0.0	0.0004	0.1	0.0000	0.0
1,1-Dichloroethane	0.0001	0.0	0.0001	0.0	0.0000	0.0	0.0031	34.7
1,1-Dichloroethene	0.0003	0.1	0.0010	0.1	0.0003	0.0	0.0000	0.0
Trans-1,2-Dichloroethene	0.0029	0.5	0.0029	0.2	0.0014	0.2	0.0000	0.0
1,2-Dichloropropane	0.6015	98.0	1.4369	97.2	0.7018	98.8	0.0000	0.0
Ethylbenzene	0.0001	0.0	0.0001	0.0	0.0001	0.0	0.0000	0.0
Methylene Chloride	0.0000	0.0	0.0002	0.0	0.0000	0.0	0.0009	10.1
Tetrachloroethene	0.0011	0.2	0.0004	0.0	0.0001	0.0	0.0000	0.0
Toluene	0.0000	0.0	0.0000	0.0	0.0000	0.0	0.0000	0.0
1,1,1-Trichloroethane	0.0008	0.1	0.0003	0.0	0.0002	0.0	0.0000	0.0
Carbon Tetrachloride#	0.0041	0.7	0.0327	2.2	0.0041	0.6	0.0000	0.0
TOTAL HAZARD INDEX*	0.6139		1.4788		0.7100		0.0090	

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* Hazard Index values greater than 1 may indicate adverse health effects.

# Concentrations based on detection limits. Not detected in samples from the Site.

Source: BCM Eastern Inc. (Project No. 00-5528-02)

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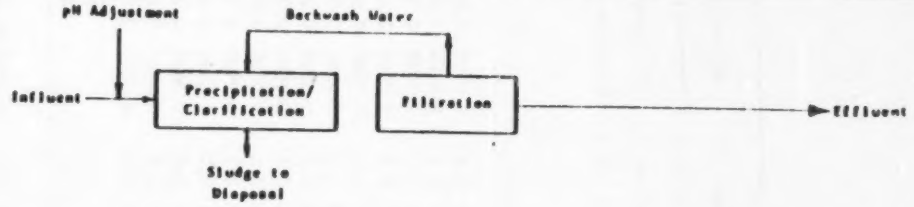
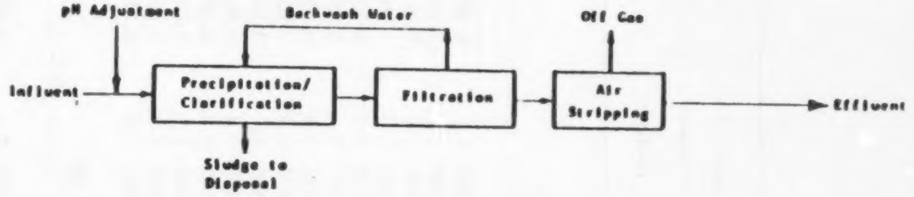
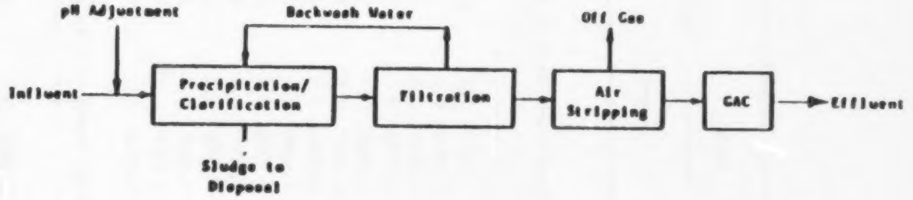
1. If heavy metals removal is the only concern based on the initial sampling results then the following should be piloted.


pH Adjustment
Backwash Water
Influent
Precipitation/
Clarification
Filtration
Effluent
Sludge to
Disposal

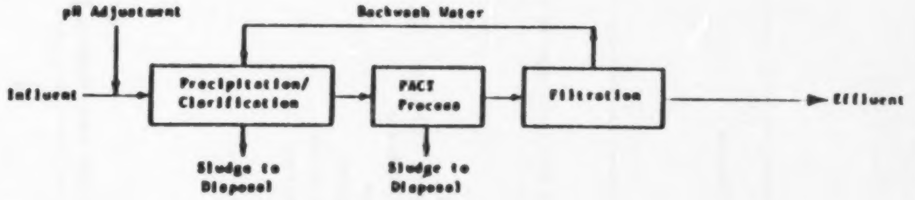
2. If heavy metals and VOCs are the concern then the following should be piloted.


pH Adjustment
Backwash Water
Off Gas
Influent
Precipitation/
Clarification
Filtration
Air
Stripping
Effluent
Sludge to
Disposal

3. If heavy metals, VOCs and refractory organics are the concern then the following should be piloted.


pH Adjustment
Backwash Water
Off Gas
Influent
Precipitation/
Clarification
Filtration
Air
Stripping
GAC
Effluent
Sludge to
Disposal

4. If heavy metals, VOCs and biodegradable organics are the concern then the following should be piloted.


pH Adjustment
Backwash Water
Influent
Precipitation/
Clarification
PACT
Process
Filtration
Effluent
Sludge to
Disposal
Sludge to
Disposal

Note: DCN's preferred alternative is essentially #2 (without filtration). The other three treatment trains are developed from technologies which have passed DCN's screening but were not preferred.

CDM

environ[illegible]ntal engineers, scientists
planne[illegible]anagement consultants

EXHIBIT 14

Pilot Study Process Schematics

Henderson Road Injection W[illegible] Site
Montgomery County, Penns[illegible]ania

EXHIBIT 15

DESIGN CRITERIA AND THEIR USE IN DESIGN FOR PROPOSED GROUND WATER TREATMENT TECHNOLOGIES

Technology	Design Criteria	Use In Design
Neutralization/ pH Adjustment	Chemical Type	Effects potential effluent quality and chemical handling requirements.
	Chemical Dosage	Effects chemical storage volume and ultimate cost of technology.
	Mixing Requirements	Effects mixing tank sizes or length of static mixers.
Settling/ Precipitation	Chemical Type	Effects settling velocity and sludge quality.
	Chemical Dosage	Effects effluent quality, sludge volume and settling rate.
	Flocculation Time	Effects size of flocculation tanks and rate of floc formation.
	Agitation Rate	Effects floc formation and settleability of solids.
	Detention Time/ Overflow Rate	Effects settling tank size and effluent quality.
	Sludge Production Rate	Effects sludge storage and disposal requirements.

(EXHIBIT 15 CONT'D)

DESIGN CRITERIA AND THEIR USE IN DESIGN FOR PROPOSED GROUND WATER TREATMENT TECHNOLOGIES

Air Stripping	Flow Rate	Effects pumping requirements and tower diameter.
	Liquid Loading Rate	Effects tower diameter.
	Air To Water Ratio	Effects removal rate and blower capacity.
	Required Removal Efficiency	Effects tower height.
	Packing Type	Effects removal efficiency and hydraulic capacity.
	Tower height	Effects tower height and pumping requirements.
Carbon Adsorption	Flow Rate	Effects carbon bed size and empty bed detention time.
	Empty Bed Detention Time	Effects scale up of full scale system.
	Liquid Loading Rate	Effects carbon bed diameter.
	Breakthrough Time	Effects frequency of carbon replacement.
PACT Process	Flow Rate	Effects size of process tankage.
	Required Carbon Dosage	Effects costs and organics removal.
	Required MLSS	Effects biological organism growth rate.
	Required Nutrient Additions	Effects biological organism growth rate.

(EXHIBIT 15 CONT'D)

DESIGN CRITERIA AND THEIR USE IN DESIGN FOR PROPOSED GROUND WATER TREATMENT TECHNOLOGIES

	Hydraulic Retention Time/ Cell Retention Time	Effects sludge production and quality.
	Sludge Production Rate	Effects storage and disposal requirement.

(311/21)NY-AMB

EXHIBIT 16

PROPOSED CHEMICAL SPECIFIC ARARs FOR A CLASS IIA AQUIFER

Parameter (ug/l)	ARAR (ug/l)	Method/ Source
Metals		
Arsenic	50.0	MCL
Cadmium	10.0	MCL
Chromium	50.0	MCL
Copper	1,300.0	MCLG
Lead	20.0	MCLG
Silver	50.0	MCLG
Zinc	5,000.0	Mc
Other Parameters		
Cyanide	200.0	AWQC
Acid Extractable Organics		
Benzoic Acid	700.0	Ma
2,4-Dimethylphenol	400.0	AWQC
Phenol	3,500.0	DWEL
2-Methylphenol	42.0	Ma
4-Methylphenol	72.0	Ma

MCL - Maximum Contaminant Levels
MCLG - Maximum Contaiminant Level Goals
AWQC - Ambient Water Quality Criteria
SNARL - Suggested No Adverse Effect Level
DWEL - Drinking Water Equivalent Level
EPA - Recommended by EPA
Ma - Model in Appendix A of RI
Mc - Organoleptic
*** - EPA Superfund Public Health Evaluation Manual, DER, Washington DC
EPA 54011 - 861060 (OSWER Directive 9,285.4-1), October 1986

(EXHIBIT 16 CONT'D)

Parameter (ug/l)	ARAR (ug/l)	Method/ Source
Base/Neutral Extractable Organics		
Bis(2-ethylhexyl)phthalate	512.0	
Butyl Benzyl Phthalate	820.0	Ma
1,2-Dichlorobenzene	620.0	MCLG
1,3-Dichlorobenzene	470.0	AWQC
1,4-Dichlorobenzene	75.0	MCL
Di-n-butyl phthalate	770.0	SNARL
Naphthalene	350.0	Ma
N-nitrosodiphenylamine	71.0	***
Benzyl alcohol	364.0	Ma
4-Chloroaniline	35.0	Ma
2-methylnaphthalene	1,750.0	Ma
Volatile Organics		
Benzene	5.52	(2)
Carbon Tetrachloride	5.0	MCL
Chlorobenzene	60.0	MCLG
Chloroethane	19,000.0	EPA
Chloroform	100.0	MCL[1]
Dibromochloromethane	100.0	MCL[1]

MCL - Maximum Contaminant Levels
MCLG - Maximum Contaiminant Level Goals
AWQC - Ambient Water Quality Criteria
SNARL - Suggested No Adverse Effect Level
DWEL - Drinking Water Equivalent Level
EPA - Recommended by EPA
Ma - Model in Appendix A of RI
Mc - Organoleptic
*** - EPA Superfund Public Health Evaluation Manual, DER, Washington DC EPA 54011 - 861060 (OSWER Directive 9,285.4-1), October 1986
(1) - This is MCL for total trihalomethanes
(2) - Alternative concentration limit based on background contamination

(EXHIBIT 16 CONT'D)

Parameter (ug/l)	ARAR (ug/l)	Method/ Source
Dichlorobromomethane	100.0	MCL
1,1-Dichloroethane	5.06	(2)
1,2-Dichloroethane	6.02	(2)
1,1-Dichloroethene	7.0	MCL
1,2-Dichloroethene	70.0	MCLG
1,2-Dichloropropane	6.28	(2)
Ethylbenzene	680.0	MCLG
Methylene Chloride	47.0	***
Tetrachloroethene (PCE)	6.9	***
Toluene	2,000.0	MCLG
Trichloroethene (TCE)	25.8	(2)
1,1,1-Trichloroethane	200	MCL
Trichlorofluoromethane	12,000.0	EPA
Vinyl Chloride	2.0	MCL
m-Xylene	175.0	DWEL
p-Xylene	175.0	DWEL

MCL - Maximum Contaminant Levels
MCLG - Maximum Contaiminant Level Goals
AWQC - Ambient Water Quality Criteria
SNARL - Suggested No Adverse Effect Level
DWEL - Drinking Water Equivalent Level
EPA - Recommended by EPA
Ma - Model in Appendix A of RI
Mc - Organoleptic
*** - EPA Superfund Public Health Evaluation Manual, DER, Washington DC EPA 54011 - 861060 (OSWER Directive 9,285.4-1), October 1986
(1) - This is MCL for total trihalomethanes
(2) - Alternate concentration limit based on background contamination

EXHIBIT 17

INTERIM OPERATING GUIDANCE FOR AIR TOXIC SUBSTANCES: NEW AND MODIFIED SOURCES (PADER)

CAS No.	Substance	Annual ATG(ug/M^3)
107-13-1	Acrylonitrile	1.47
7440-36-0	Antimony (and compounds)	1.2
7440-38-2	Arsenic (and compounds)	0.024
1332-21-4	Asbestos**	0.0132
71-43-2	Benzene	12.5
92-87-5	Benzidine	30
50-32-8	Benzo(a)Pyrene (combustion product)	0.0007
7440-41-7	Beryllium (and compounds)	0.01
542-88-1	Bis(Chloro Methyl)Ether	0.0113
7440-43-9	Cadmium (and compounds)	0.0556
56-23-5	Carbon Tetrachloride	6.67
67-66-3	Chloroform	4.35
107-30-2	Chloromethyl Methyl Ether	0.0657
7440-47-3	Chromium VI (and compounds)	0.00833
91-94-1	3,3'Dichlorobenzidine	Not established
117-81-7	Di(2-Ethylhexyl)Phthalate	120
77-78-1	Dimethyl Sulfate	12.4
123-91-1	Dioxane	86.3
106-93-4	Ethylene Dibromide	18.4
107-06-2	Ethylene Dichloride	3.85
75-21-8	Ethylene Oxide	1
96-45-7	Ethylene Thiourea	0.7

(EXHIBIT 17 CONT'D)

CAS No.		Substance	Annual ATG(ug/M^3)
106-89-8		Epichlorohydrin	9.06
50-00-0	(A)	Formaldehyde	5.88
87-68-3		Hexachlorobutadiene	0.639
680-31-9		Hexamethyl Phosphoramide	0.0176
302-01-2		Hydrazine	0.314
7439-92-1		Lead (and compounds)	1.5
7439-96-5		Manganese (and compounds)	24
7439-97-6		Mercury (and compounds)	0.24
74-83-9		Methyl Bromide	465
74-87-3		Methyl Chloride	2,470
101-14-4		4,4'-Methylene Bis(2-Chloroaniline)	0.545
75-09-2		Methylene Chloride	24.2
60-34-4		Monomethyl Hydrazine	0.94
7440-02-0	(A)	Nickel (and compounds)	0.24
92-93-3		4-Nitrodiphenyl	2.7
---		Particulate Polycyclic Aromatic Hydrocarbons (combustion product)	0.48
127-18-4		Perchloroethylene	172.4
108-95-2		Phenol	461
67774-32-7		Polybrominated Biphenyls	Not established
53469-21-9; 11097-69-1		Polychlorinated Biphenyls	0.18
57-57-8		2-Propiolactone	Not established
75-56-9		Propylene Oxide	26.7

(EXHIBIT 17 CONT'D)

CAS No.	Substance	Annual ATG(ug/M^3)
79-34-5	Tetrachloroethane	165
7440-28-0	Thallium (and compounds)	2.4
119-93-7	o-Tolidine	Not established
79-01-6	Trichloroethylene	76.9
593-60-2	Vinyl Bromide	52.4
75-01-4	Vinyl Chloride	6.12
106-87-6	Vinyl Cyclohexene Dioxide	137
75-35-4	Vinylidene Chloride	2
79-00-5	Vinyl Trichloride	1,300
309-00-2	Aldrin	0.035
92-67-1	4-Aminodiphenyl	0.8
61-82-5	3-Amino-1,2,4-Triazole	1.8
58-89-9	Benzene Hexachloride	1.2
58-89-9	Lindane (and isomers)	1.2
111-44-4	Bis(2-Chloroethyl)Ether	700
23746-34-1	Bis(2-Hydroxyethyl)-Dithiocarbamic Acid, Potassium Salt	Not established
133-06-2	Captan	35
63-25-2	Carbaryl	3.5
130-90-4	Chloramben	1,333
57-74-9	Chlordane	0.35
510-15-6	Chlorobenzilate	7

(EXHIBIT 17 CONT'D)

CAS No.	Substance	Annual ATG(ug/M^3)
50-29-3; 53-19-0; 72-54-8	DDT/DDD	1.8
96-12-8	1,2Dibromo-3-Chloropropane	0.964
94-75-7	2,4-Dichlorophenoxy Acetic Acid	105
60-57-1	Dieldrin	0.035
79-44-7	Dimethylcarbamyl Chloride	1.06
57-14-7	1,1-Dimethyl Hydrazine	2.94
115-29-7	Endosulfan	2.4
72-20-8	Endrin	0.07
142-59-6; 12427-38-2; 12122-67-7	Ethylene Bisdithiocarbamic Acid Salts	18
76-44-8	Heptachlor	0.18
118-74-1	Hexachlorobenzene	0.204
115-32-2	Kelthane	8.8
143-50-0	Kepone	0.88
72-43-5	Methoxychlor	35
74-88-4	Methyl Iodide	28.9
2385-85-5	Mirex	0.88
91-59-8	2-Naphthylamine	19
534-52-1	Nitrofen	0.75
79-46-9	2-Nitropropane	21.8
62-75-9	N-Nitrosodimethylamine	0.00121
56-38-2	Parathion	1.8

(EXHIBIT 17 CONT'D)

CAS No.	Substance	Annual ATG(ug/M^3)
87-86-5	Pentachlorophenol	12
135-88-6	N-Phenyl-2-Naphthylamine	45
1120-71-4	Propane Sultone	Not established
75-55-8	Propylene Imine	11.2
82-68-8	Quintozene	2.4
61789-48-2	Strobane	7.7
140-57-8	Aramite	18
1746-01-6	2,3,7,8-Tetrachlorinated Dibenzo-p-Dioxin	0.0000303*
961-11-5 88-06-2; 95-95-4; 25167-82-2	Tetra Trichlorophenol isomers	3,500
93-76-5	2,4,5-Trichlorophenoxy Acetic Acid (2,4,5-T)	1
1582-09-8	Trifluralin	1,150
8001-35-2	Toxaphene	1.2

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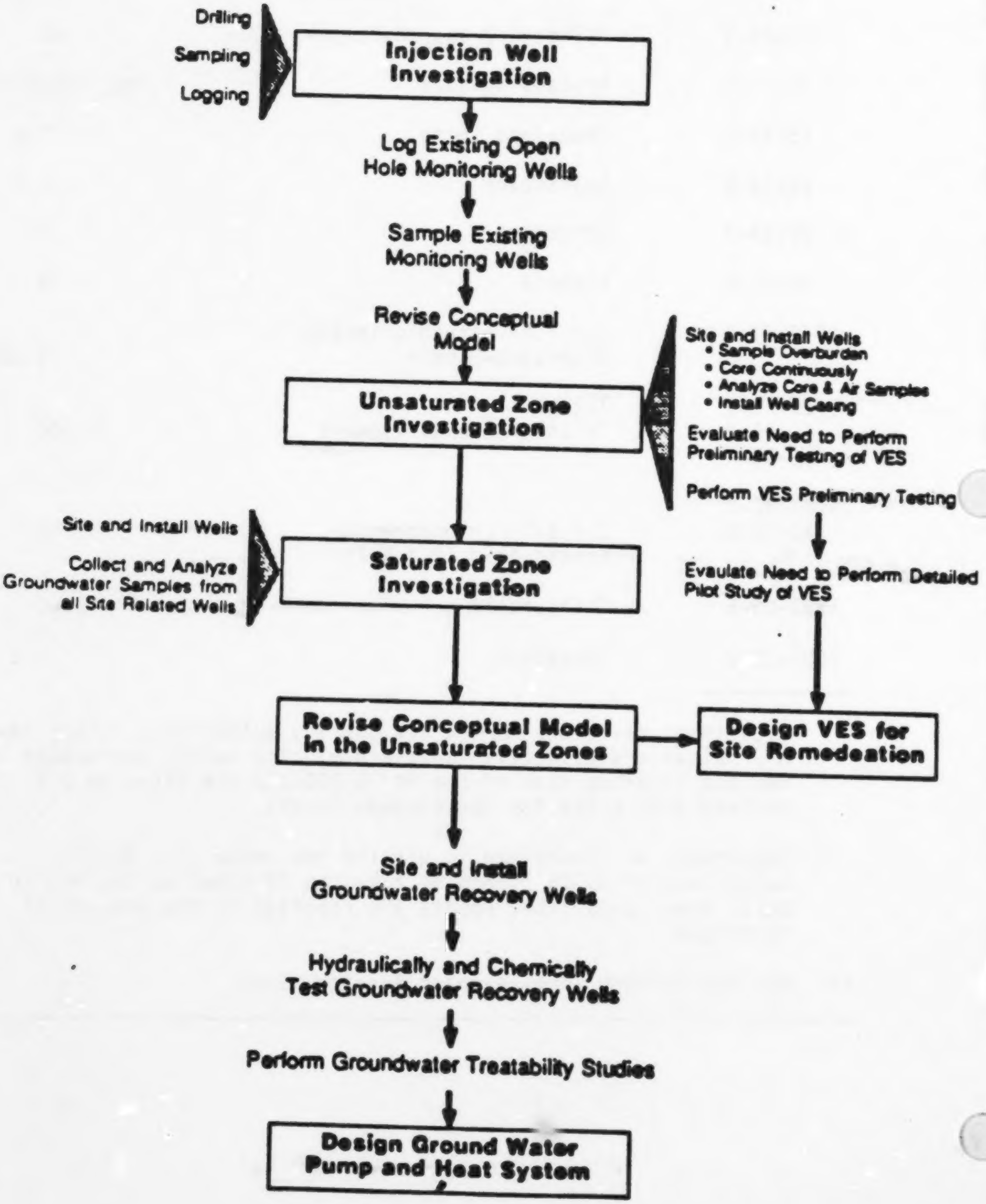
* Department revisions to AMS Air Quality Guidelines. These revised ATG values are effective immediately. The values correspond to a maximum lifetime risk of one in 10,000 and are based on U.S. EPA derived unit risks for carcinogens in air.

** Department will continue to use the AMS Annual Air Quality Guidelines of 0.005 fibers of asbestos >5 u/cm^3 as the ATG in cases where only fiber counts are reported by the analytical technique.

*** Maximum 24-hour Time-Weighted Average (TWA).

EXHIBIT 18

Overview of Predesign Activities Progress of Events


Drilling
Sampling
Logging
Injection Well Investigation
Log Existing Open Hole Monitoring Wells
Sample Existing Monitoring Wells
Revise Conceptual Model
Site and Install Wells
• Sample Overburden
• Core Continuously
• Analyze Core & Air Samples
• Install Well Casing
Evaluate Need to Perform Preliminary Testing of VES
Perform VES Preliminary Testing
Unsaturated Zone Investigation
Site and Install Wells
Collect and Analyze Groundwater Samples from all Site Related Wells
Saturated Zone Investigation
Evaluate Need to Perform Detailed Pilot Study of VES
Revise Conceptual Model in the Unsaturated Zones
Design VES for Site Remedeation
Site and Install Groundwater Recovery Wells
Hydraulically and Chemically Test Groundwater Recovery Wells
Perform Groundwater Treatability Studies
Design Ground Water Pump and Heat System

Detailed Outline of Progress of Events for the Injection Well Investigation

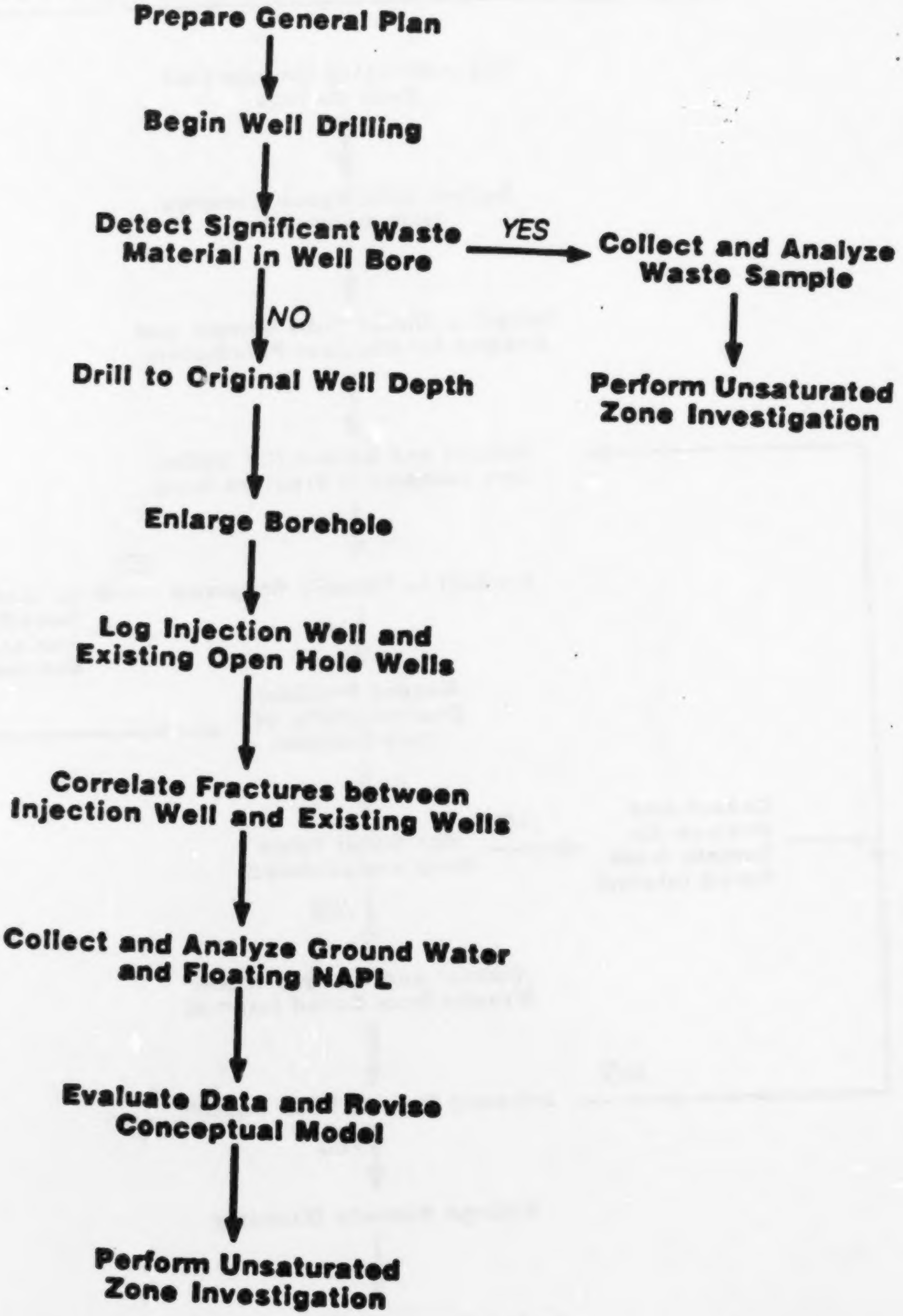
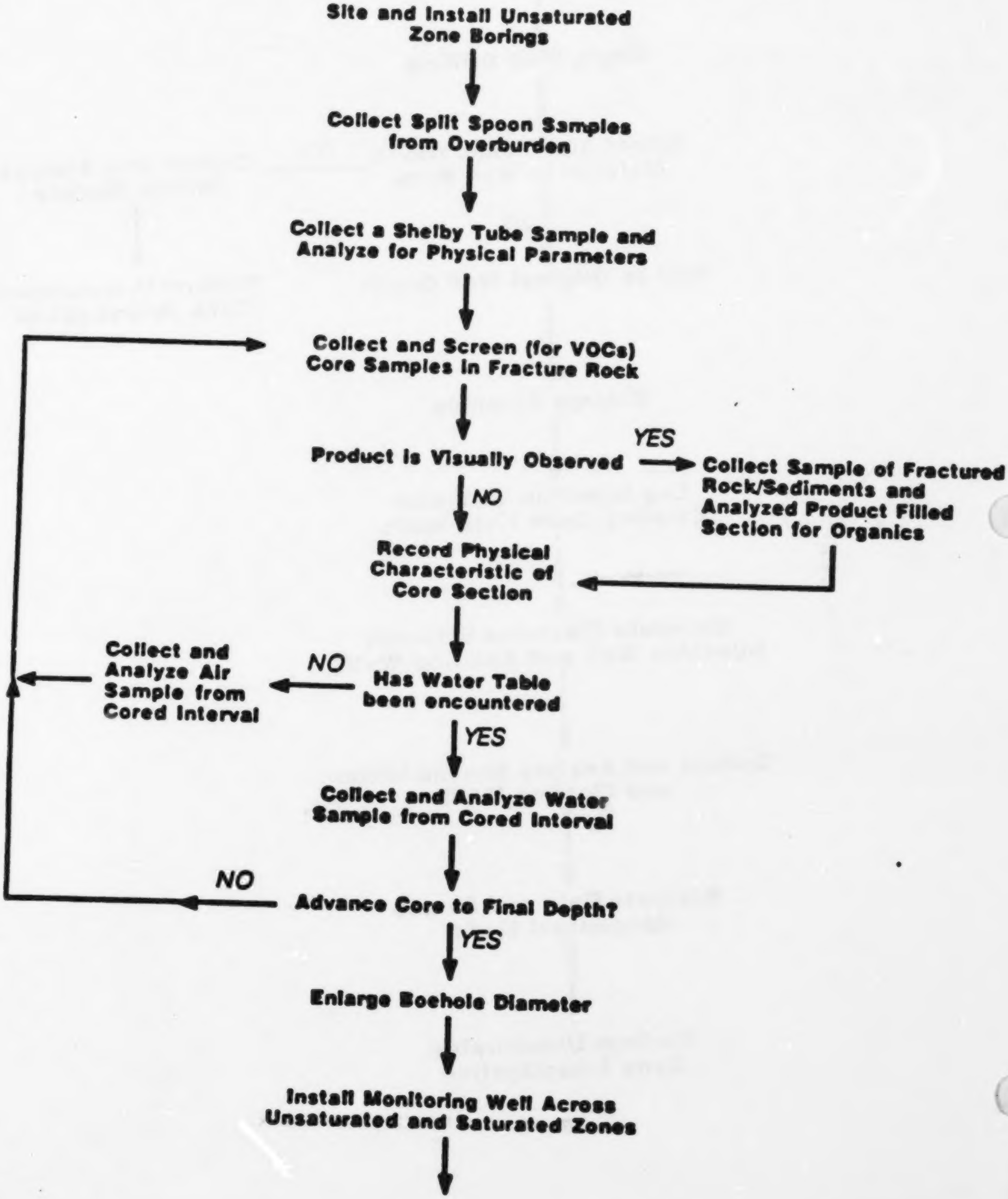
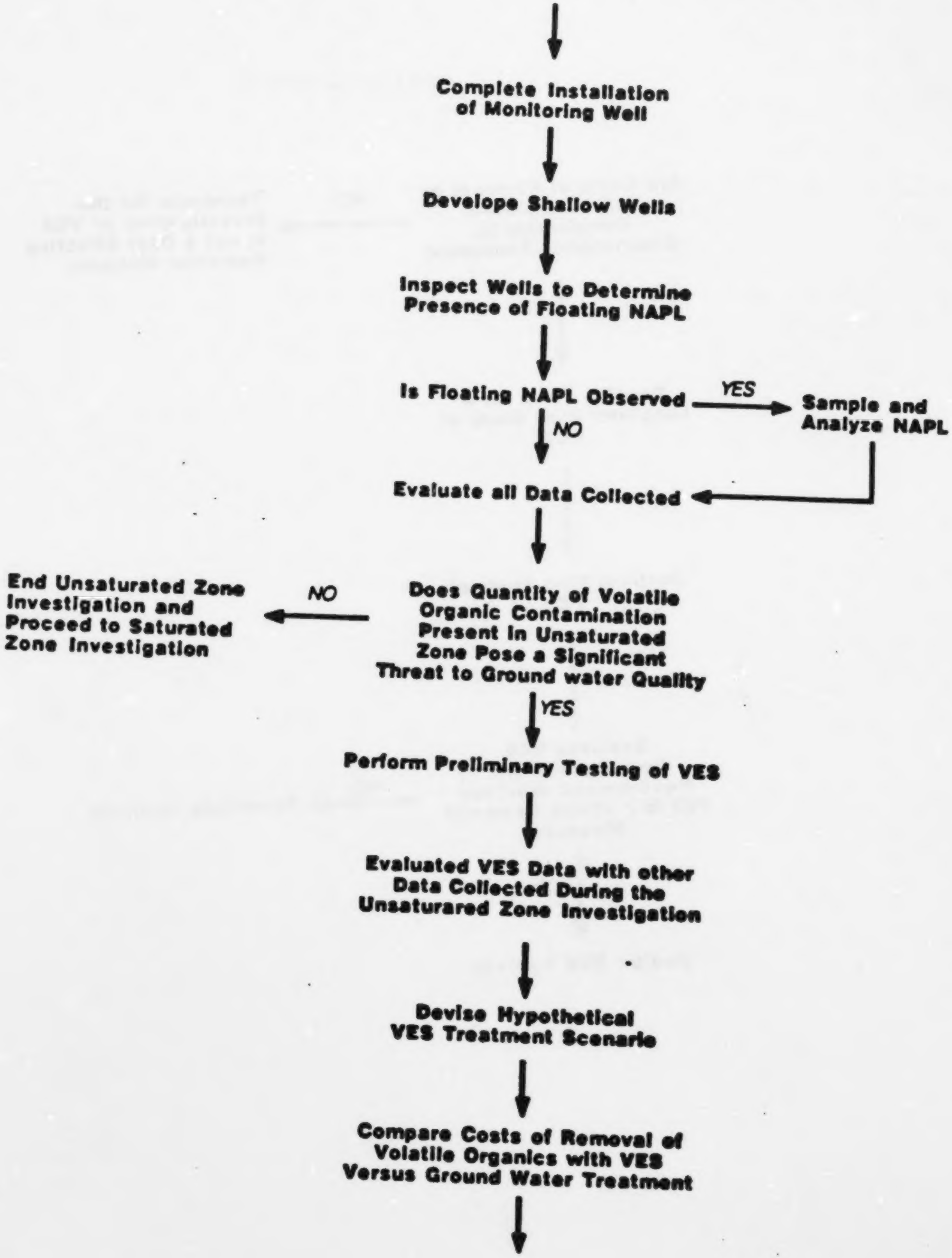

Prepare General Plan
Begin Well Drilling
Detect Significant Waste Material in Well Bore
YES
Collect and Analyze Waste Sample
Perform Unsaturated Zone Investigation
NO
Drill to Original Well Depth
Enlarge Borehole
Log Injection Well and Existing Open Hole Wells
Correlate Fractures between Injection Well and Existing Wells
Collect and Analyze Ground Water and Floating NAPL
Evaluate Data and Revise Conceptual Model
Perform Unsaturated Zone Investigation

EXHIBIT [illegible]

Detailed Progress of Events for Unsaturated Zone Investigation


Site and Install Unsaturated Zone Borings
Collect Split Spoon Samples from Overburden
Collect a Shelby Tube Sample and Analyze for Physical Parameters
Collect and Screen (for VOCs) Core Samples in Fracture Rock
Product is Visually Observed
YES
Collect Sample of Fractured Rock/Sediments and Analyzed Product Filled Section for Organics
NO
Record Physical Characteristic of Core Section
Has Water Table been encountered
NO
Collect and Analyze Air Sample from Cored Interval
YES
Collect and Analyze Water Sample from Cored Interval
Advance Core to Final Depth?
NO
YES
Enlarge Boehole Diameter
Install Monitoring Well Across Unsaturated and Saturated Zones


Complete Installation of Monitoring Well
Develope Shallow Wells
Inspect Wells to Determine Presence of Floating NAPL
Is Floating NAPL Observed
YES
Sample and Analyze NAPL
NO
Evaluate all Data Collected
Does Quantity of Volatile Organic Contamination Present in Unsaturated Zone Pose a Significant Threat to Ground water Quality
NO
End Unsaturated Zone Investigation and Proceed to Saturated Zone Investigation
YES
Perform Preliminary Testing of VES
Evaluated VES Data with other Data Collected During the Unsaturared Zone Investigation
Devise Hypothetical VES Treatment Scenarie
Compare Costs of Removal of Volatile Organics with VES Versus Ground Water Treatment

(EXHIBIT 20 CONT'D)

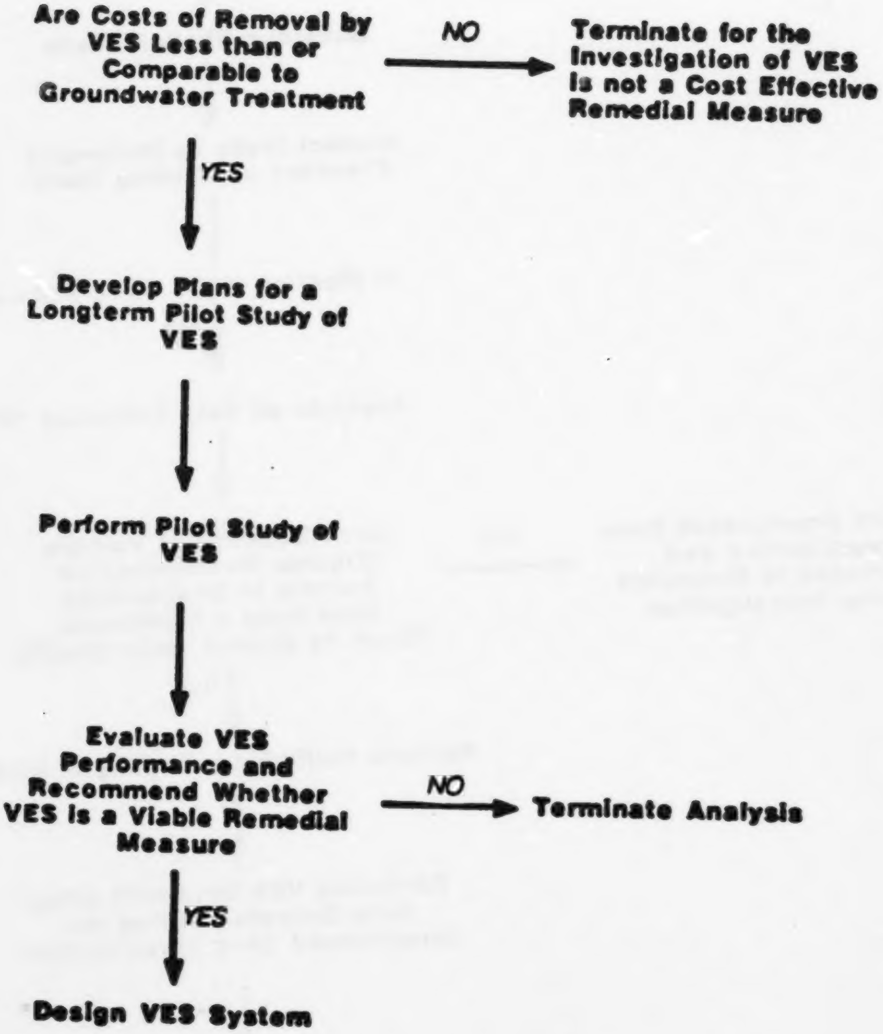

Are Costs of Removal by VES Less than or Comparable to Groundwater Treatment
NO
Terminate for the Investigation of VES is not a Cost Effective Remedial Measure
YES
Develop Plans for a Longterm Pilot Study of VES
Perform Pilot Study of VES
Evaluate VES Performance and Recommend Whether VES is a Viable Remedial Measure
NO
Terminate Analysis
YES
Design VES System

EXHIBIT 11

Detailed Progress of Events for Saturated Zone Investigation

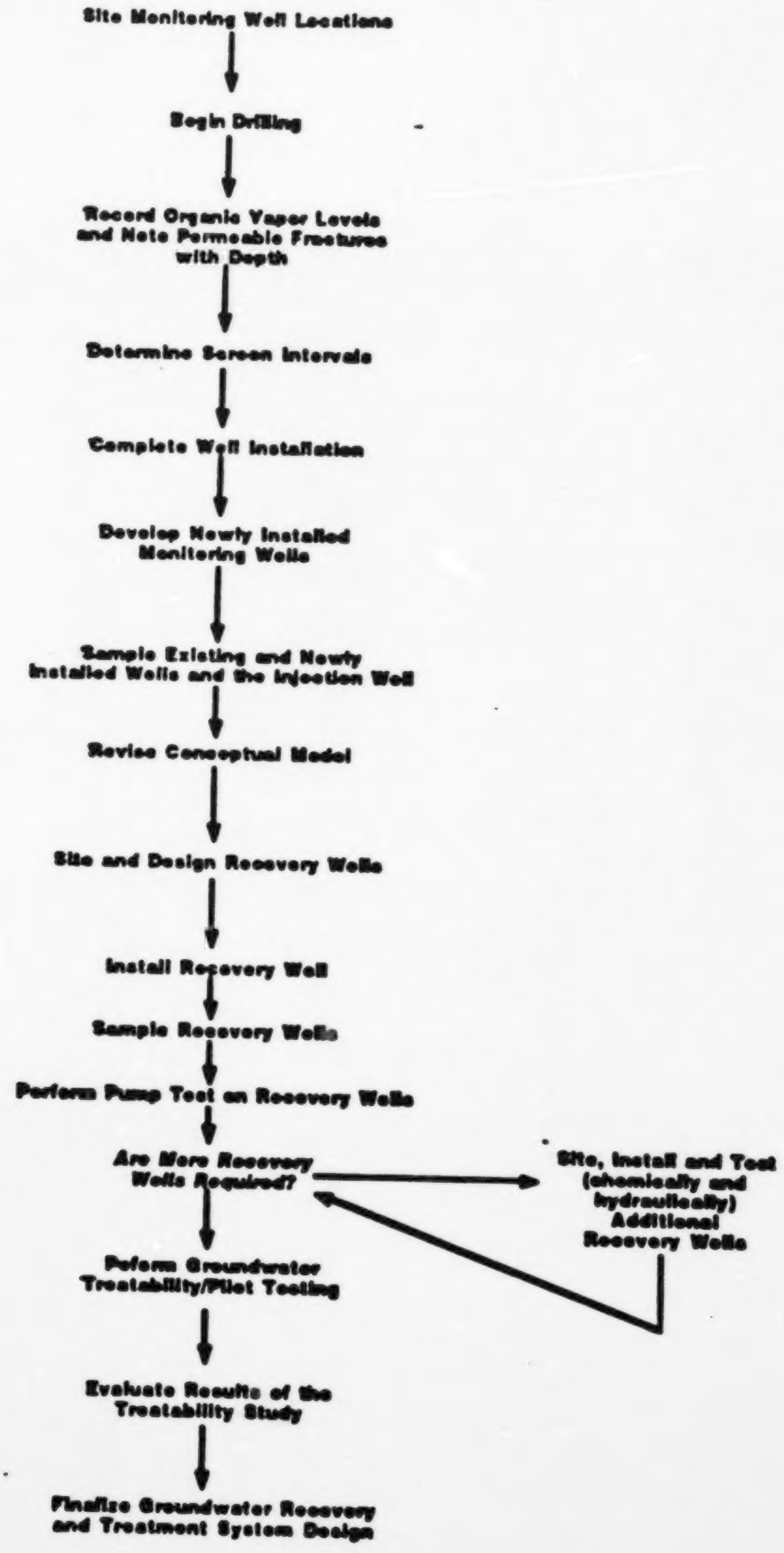

Site Monitoring Well Locations
Begin Drilling
Record Organic Vapor Levels and Note Permeable Fractures with Depth
Determine Screen Intervals
Complete Well Installation
Develop Newly Installed Monitoring Wells
Sample Existing and Newly Installed Wells and the Injection Well
Revise Conceptual Model
Site and Design Recovery Wells
Install Recovery Well
Sample Recovery Wells
Perform Pump Test on Recovery Wells
Are More Recovery Wells Required?
Site, Install and Test (chemically and hydraulically) Additional Recovery Wells
Peform Groundwater Treatability/Pilot Testing
Evaluate Results of the Treatability Study
Finalize Groundwater Recovery and Treatment System Design

EXHIBIT [illegible]
ALTERNATIVE
7A
WITHOUT ISV AND DOWNGRADIENT PUMP AND TREAT
(CAPITAL AND O&M)

YEAR	ANNUAL OUTLAY ($)	DISCOUNT FACTOR	PRESENT WORTH ($)
1	2,663,380	1.000	2,663,380.00
2	290,455	0.909	264,023.60
3	290,455	0.826	239,915.83
4	290,455	0.751	218,131.71
5	290,455	0.683	198,360.77
6	290,455	0.621	180,372.56
7	290,455	0.564	163,816.62
8	290,455	0.513	149,003.42
9	290,455	0.467	135,642.49
10	290,455	0.424	123,152.92
11	290,455	0.386	112,115.63
12	290,455	0.350	101,659.25
13	290,455	0.319	92,655.15
14	290,455	0.290	84,231.95
15		0.263	242,079.67
16	290,455	0.239	69,418.75
17	290,455	0.218	63,319.19
18	290,455	0.198	57,510.09
19	290,455	0.180	52,281.90
20	290,455	0.164	47,634.62
21	290,455	0.149	43,277.80
22	290,455	0.135	39,211.43
23	290,455	0.123	35,725.97
24	290,455	0.112	32,530.96
25	290,455	0.102	29,626.41
26	290,455	0.092	26,721.86
27	290,455	0.084	24,398.22
28	290,455	0.076	22,074.58
29	290,455	0.069	20,041.40
30	290,455	0.063	18,298.67
TOTAL			5,550,633.42

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EXHIBIT 22

CAPITAL COST SUMMARY - 7A
WITHOUT ISV AND DOWNGRADIENT PUMP AND TREAT

TASK	BCM ($)	EPA ($)
Injection well investigation	$0	$30,000
Installation of monitoring wells	$765,000	$1,014,200
Installation of McIlvain treatment system	$1,200	$1,200 •
Excavation of contaminated sediments	$15,300	$15,300 •
Landfill disposal	$1,040	$1,040 •
Installation of recovery wells onsite	$425,000	$425,000 •
Ground water treatment system onsite	$630,000	$630,000 •
Including ISV Subtotal	$1,837,540	$2,116,740
Ground water pilot study contingency (15%)	$94,500	$94,500
TOTAL	$1,932,040	$2,263,440

• Costs obtained from BCM

EXHIBIT II
[illegible]
PUMP AND TREAT

OPERATIONS AND MAINTENANCE

COST SUMMARY

TASK	BCM ($)	EPA ($)
Year 1:		
Ground water sampling	$65,550	$108,600
Expenses and labor	$25,000	$70,760
Sediment sampling	$0	$3,600
Air sampling	$0	$3,300
McIlvain treatment	$180	$160 •
McIlvain sampling (total VOCs) plus expenses	$1,000	$1,600
Hubing sampling (total VOCs) plus expenses	$0	$1,600
Sedimentation/Precipitation (onsite)	$60,000	$60,000 •
Air stripper (onsite)	$22,000	$22,000 •
GAC replacement	$102,000	$102,000 •
Recovery well bore cleanout	$10,800	$10,800 •
Effluent sampling	$15,300	$15,300 •
TOTAL for Year 1	$301,830	$399,940
Year 2:		
Ground water sampling	$54,150	$43,575
Expenses and labor	$25,000	$41,600
McIlvain treatment	$180	$180 •
McIlvain sampling (total VOCs) plus expenses	$1,000	$1,600
Hubing sampling (total VOCs) plus expenses	$0	$1,600
Sedimentation/Precipitation (onsite)	$60,000	$60,000 •
Air stripper (onsite)	$22,000	$22,000 •
GAC replacement	$102,000	$102,000 •
Recovery well bore cleanout	$10,800	$10,800 •
Effluent sampling	$7,100	$7,100 •
TOTAL for year 2	$282,230	$290,455
Year 3-30:		
Ground water sampling •	$46,650	$43,575
Expenses and labor	$20,000	$41,600
McIlvain treatment	$160	$180 •
McIlvain sampling (total VOCs) plus expenses	$1,000	$1,600
Hubing sampling (total VOCs) plus expenses	$0	$1,600
Sedimentation/Precipitation (onsite)	$60,000	$60,000 •
Air stripper (onsite)	$22,000	$22,000 •
GAC replacement	$102,000	$102,000 •
Recovery well bore cleanout	$10,800	$10,800 •
Effluent sampling	$7,100	$7,100 •
TOTAL for years 3-30	269,730	$290,455

• All monitoring wells should be analyzed for the full TCL at least every five years (if not more frequently) to evaluate the effectiveness of the alternative. The analytical cost for this analysis is

EXHIBIT 22
TA-WITHOUT SSV AND DOWNGRADIENT
PUMP AND TREAT

OPERATIONS AND MAINTENANCE

COST SUMMARY

TASK	BCM ($)	EPA ($)
$44,000.		

- Costs obtained from BCM

[illegible]

[illegible]

[illegible]

YEAR	ANNUAL OUTLAY ($)	DISCOUNT FACTOR	PRESENT WORTH ($)
1	399,940	1.000	399,940.00
2	290,455	0.909	264,023.60
3	290,455	0.826	239,915.83
4	290,455	0.751	218,131.71
5	290,455	0.683	198,380.77
6	290,455	0.621	180,372.56
7	290,455	0.564	163,816.62
8	290,455	0.513	149,003.42
9	290,455	0.467	135,642.49
10	290,455	0.424	123,152.92
11	290,455	0.386	112,115.63
12	290,455	0.350	101,659.25
13	290,455	0.319	92,655.15
14	290,455	0.290	84,231.95
15	920,455	0.263	242,079.67
16	290,455	0.239	69,418.75
17	290,455	0.218	63,319.19
18	290,455	0.198	57,510.09
19	290,455	0.180	52,281.90
20	290,455	0.164	47,634.62
21	290,455	0.149	43,277.80
22	290,455	0.135	39,211.43
23	290,455	0.123	35,725.97
24	290,455	0.112	32,530.96
25	290,455	0.102	29,626.41
26	290,455	0.092	26,721.86
27	290,455	0.084	24,398.22
28	290,455	0.076	22,074.58
29	290,455	0.069	20,041.40
30	290,455	0.063	18,298.67
TOTAL			3,287,193.42

EXHIBIT 22
ALTERNATIVE
7A-WITHOUT ISV
(CAPITAL AND O&M)

YEAR	ANNUAL OUTLAY ($)	DISCOUNT FACTOR	PRESENT WORTH ($)
1	3,482,880	1.000	3,482,880.00
2	373,655	0.909	339,652.40
3	373,655	0.826	308,639.03
4	373,655	0.751	280,614.91
5	373,655	0.683	255,206.37
6	373,655	0.621	232,039.76
7	373,655	0.564	210,741.42
8	373,655	0.513	191,685.02
9	373,655	0.467	174,496.89
10	373,655	0.424	158,429.72
11	373,655	0.386	144,230.83
12	373,655	0.350	130,779.25
13	373,655	0.319	119,195.95
14	373,655	0.290	108,359.95
15	1,351,655	0.263	355,485.27
16	373,655	0.239	89,303.55
17	373,655	0.218	81,456.79
18	373,655	0.198	73,983.69
19	373,655	0.180	67,257.90
20	373,655	0.164	61,279.42
21	373,655	0.149	55,674.60
22	373,655	0.135	50,443.43
23	373,655	0.123	45,959.57
24	373,655	0.112	41,849.36
25	373,655	0.102	38,112.81
26	373,655	0.092	34,376.26
27	373,655	0.084	31,387.02
28	373,655	0.076	28,397.78
29	373,655	0.069	25,782.20
30	373,655	0.063	23,540.27
TOTAL			7,241,241.42

EXHIBIT 22

CAPITAL COST SUMMARY - 7A
WITHOUT ISV

TASK	BCM ($)	EPA ($)
Injection well investigation	$0	$30,000
Installation of monitoring wells	$765,000	$1,014,200
Installation of McIlvain treatment system	$1,200	$1,200 *
Excavation of contaminated sediments	$15,300	$15,300 *
Landfill disposal	$1,040	$1,040 *
Installation of recovery wells onsite	$425,000	$425,000 *
Installation of recovery wells downgradient	$380,000	$380,000 *
Ground water treatment system onsite	$630,000	$630,000 *
Ground water treatment system downgradient	$348,000	$348,000 *
Subtotal	$2,565,540	$2,829,440
Ground water pilot study contingency (15%)	$146,700	$146,700
TOTAL	$2,712,240	$2,991,440

*Costs from BCM

EXHIBIT II
[illegible]
WITH OR WITHOUT ISV
OPERATIONS AND MAINTENANCE

COST SUMMARY

TASK	BCM ($)	EPA ($)
Year 1:		
Ground water sampling	$65,550	$108,600
Expenses and labor	$25,000	$70,760
Sediment sampling	$0	$3,800
Air sampling	$0	$3,300
McIlvain treatment	$180	$180 •
McIlvain sampling (total VOCs) plus expenses	$1,000	$1,600
Hubing sampling (total VOCs) plus expenses	$0	$1,600
Sedimentation/Precipitation (onsite)	$60,000	$60,000 •
Sedimentation/Precipitation (downgradient)	$59,000	$59,000 •
Air stripper (onsite)	$22,000	$22,000 •
Air stripper (downgradient)	$6,000	$6,000 •
GAC replacement	$102,000	$102,000 •
Recovery well bore cleanout	$10,800	$21,600 •
Effluent sampling	$31,000	$31,000 •
TOTAL for Year 1	$382,530	$491,440
Year 2:		
Ground water sampling	$54,150	$43,575
Expenses and labor	$25,000	$41,600
McIlvain treatment	$180	$180 •
McIlvain sampling (total VOCs) plus expenses	$1,000	$1,600
Hubing sampling (total VOCs) plus expenses	$0	$1,600
Sedimentation/Precipitation (onsite)	$60,000	$60,000 •
Sedimentation/Precipitation (downgradient)	$59,000	$59,000 •
Air stripper (onsite)	$22,000	$22,000 •
Air stripper (downgradient)	$6,000	$6,000 •
GAC replacement	$102,000	$102,000 •
Recovery well bore cleanout	$10,800	$21,600 •
Effluent sampling	$14,500	$14,500 •
TOTAL for year 2	$354,630	$373,655
Year 3-30:		
Ground water sampling •	$46,650	$43,575
Expenses and labor	$20,000	$41,600
McIlvain treatment	$180	$180 •
McIlvain sampling (total VOCs) plus expenses	$1,000	$1,600
Hubing sampling (total VOCs) plus expenses	$0	$1,600
Sedimentation/Precipitation (onsite)	$60,000	$60,000 •
Sedimentation/Precipitation (downgradient)	$59,000	$59,000 •
Air stripper (onsite)	$22,000	$22,000 •
Air stripper (downgradient)	$6,000	$6,000 •
GAC replacement	$102,000	$102,000 •
Recovery well bore cleanout	$10,800	$21,600 •

[illegible]

[illegible]

WITH OR WITHOUT [illegible]
OPERATIONS AND MAINTENANCE

COST SUMMARY

TASK	BCM ($)	EPA ($)
Effluent sampling	$14,500	$14,500 *
TOTAL for years 3-30	$342,130	$373,655

* All monitoring wells should be analyzed for the full TCL at least every five years (if not more frequently) to evaluate the effectiveness of the alternative. The analytical cost for this analysis is $44,000.

EXHIBIT 11
ALTERNATIVE
[illegible]
(CAPITAL AND O&M)

YEAR	ANNUAL OUTLAY ($)	DISCOUNT FACTOR	PRESENT WORTH ($)
1	8,463,780	1.000	8,463,780.00
2	373,655	0.909	339,652.40
3	373,655	0.826	308,639.03
4	373,655	0.751	280,614.91
5	373,655	0.683	255,206.37
6	373,655	0.621	232,039.76
7	373,655	0.564	210,741.42
8	373,655	0.513	191,685.02
9	373,655	0.467	174,496.89
10	373,655	0.424	158,429.72
11	373,655	0.386	144,230.83
12	373,655	0.350	130,779.25
13	373,655	0.319	119,195.95
14	373,655	0.290	108,359.95
15	1,351,655	0.263	355,485.27
16	373,655	0.239	89,303.55
17	373,655	0.218	81,456.79
18	373,655	0.198	73,983.69
19	373,655	0.180	67,257.90
20	373,655	0.164	61,279.42
21	373,655	0.149	55,674.60
22	373,655	0.135	50,443.43
23	373,655	0.123	45,959.57
24	373,655	0.112	41,849.36
25	373,655	0.102	38,112.81
26	373,655	0.092	34,376.26
27	373,655	0.084	31,387.02
28	373,655	0.076	28,397.78
29	373,655	0.069	25,782.20
30	373,655	0.063	23,540.27
TOTAL	-		12,222,141.42

EXHIBIT 22

CAPITAL COST SUMMARY - 7A
WITH ISV

TASK	BCM ($)	EPA ($)
Injection well investigation	$0	$30,000
Installation of monitoring wells	$765,000	$1,014,200
Installation of McIlvain treatment system	$1,200	$1,200 *
Excavation of contaminated sediments	$15,300	$15,300 *
Landfill disposal	$1,040	$1,040 *
Installation of recovery wells onsite	$425,000	$425,000 *
Installation of recovery wells downgradient	$380,000	$380,000 *
Ground water treatment system onsite	$630,000	$630,000 *
Ground water treatment system downgradient	$348,000	$348,000 *
ISV prepilot study	$0	$130,900
ISV pilot test	$150,000	$150,000 *
ISV treatment	$4,700,000	$4,700,000 *
Subtotal	$7,415,540	$7,825,640
Ground water pilot study contingency (15%)	$146,700	$146,700
TOTAL	$7,562,240	$7,972,340

*Costs from BCM

ALTERNATIVE
7A
(O&M ONLY)

YEAR	ANNUAL OUTLAY ($)	DISCOUNT FACTOR	PRESENT WORTH ($)
1	491,440	1.000	491,440.00
2	373,655	0.909	339,652.40
3	373,655	0.826	308,639.03
4	373,655	0.751	280,614.91
5	373,655	0.683	255,206.37
6	373,655	0.621	232,039.76
7	373,655	0.564	210,741.42
8	373,655	0.513	191,685.02
9	373,655	0.467	174,496.89
10	373,655	0.424	158,429.72
11	373,655	0.386	144,230.83
12	373,655	0.350	130,779.25
13	373,655	0.319	119,195.95
14	373,655	0.290	108,359.95
15	1,351,655	0.263	355,485.27
16	373,655	0.239	89,303.55
17	373,655	0.218	81,456.79
18	373,655	0.198	73,983.69
19	373,655	0.180	67,257.90
20	373,655	0.164	61,279.42
21	373,655	0.149	55,674.60
22	373,655	0.135	50,443.43
23	373,655	0.123	45,959.57
24	373,655	0.112	41,849.36
25	373,655	0.102	38,112.81
26	373,655	0.092	34,376.26
27	373,655	0.084	31,387.02
28	373,655	0.076	28,397.78
29	373,655	0.069	25,782.20
30	373,655	0.063	23,540.27
TOTAL			4,249,801.42

EXHIBIT 22

HENDERSON ROAD FEASIBILITY STUDY
ASSUMPTIONS FOR ALTERNATIVE 7

1. Injection Well Investigation

A. The well will be redrilled using air rotary. The first pass will be with a 6 inch bit to open the well. The second pass will be with an expandable bit.

B. Downhole logging will be conducted on the injection well and the existing monitoring wells.

2. Installation of Monitoring Wells

Onsite Monitoring Wells

A. All wells will be drilled and installed in multiple stages to allow for:

- Exploration and lithologic identification using split-spoon samples and shelby tube collections in the over burden using mud rotary.
- Continuous coring through the unsaturated fractured rock for vadose zone exploration (gas sampling) and fracture trace identification.
- Air rotary drilling to enlarge the borehole for well casing installations.

B. Overburden thickness is approximately 40 feet.

C. Depth to water is approximately 125 feet below ground level (BGL)..Therefore unsaturated rock thickness is 85 feet.

D. A total of 15 wells are to be installed onsite:

- 10 wells installed to 140 feet (BGL)
- 2 wells installed to 250 feet (BGL)
- 3 wells installed to 450 feet (BGL)

E. Well construction materials for the 4 inch monitoring wells will be PVC risers and 20 foot stainless steel screens. The 8 wells for the unsaturated zone investigation will have 50 foot screens.

F. Continuous coring is to be completed in the bedrock in 8 shallow well borings to a depth of 15 feet below the water table. One hour per sample is allowed for vadose zone gas collection in these 8 shallow wells.

EXHIBIT 22

G. Level B safety protection is to be used unless downgrading is approved by the site Health and Safety Coordinator.

H. Three hours per well allowed for well development.

I. All cuttings are to be contained in drums. The drums are to be transported to a secure location onsite for storage.

J, Mob/demob includes all costs to the driller to complete the work, obtain permits, create access, allow an appropriate per diem and incidential costs.

K. Three hours per well is allowed for proper decontamination of drilling and sampling equipment.

L. Expected time frame to complete the well installations is:

- 50 hours per shallow well
- 40 hours per intermediate well
- 70 hours per deep well

M. Two rigs are used for drilling.

Offsite Monitoring Wells

A. All wells will be drilled and installed in multiple stages to allow for:

- Exploration and lithologic identification using split-spoon samples and shelby tube collections in the over burden using mud rotary.
- Air rotary drilling to enlarge the borehole for well casing installations.

B. Overburden thickness is approximately 85 feet.

C. Depth to water is approximately 125 feet below ground level (BGL). Therefore unsaturated rock thickness is 40 feet.

D. A total of 13 wells (downgradient and upgradient) are to be installed offsite:

- 3 wells installed to 140 feet (BGL)
- 5 wells installed to 250 feet (BGL)
- 5 wells installed to 450 feet (BGL)

E. Well construction materials for the 4 inch monitoring wells will be PVC risers and 20 foot stainless steel screens.

EXHIBIT 22

- TDS
- Oil and Grease
- Alkalinity
- Hardness

D. Quarterly sampling of these wells will be conducted for Votatile Organic Analysis (VOA).

E. Labor and expenses include well purging, time and materials for obtaining the samples, and transportation to the laboratory under proper chain-of-custody procedures for analysis.

F. Quality Assurance/Quality Control (QA/QC) samples, such as trip blanks, field blanks, field duplicates, etc., will also be obtained during each round of sampling in accordance with current EPA ground water sampling protocols.

__Year 2-30__

A. The upgradient well cluster, and five downgradient and thirteen onsite wells which consistently exhibit the highest levels of contamination, will be sampled quarterly for VOAs.

B. These twenty wells will also be sampled annually for TCL semivolatile compounds to evaluate the migration/attenuation of these compounds.

C. The remaining twenty wells will be sampled annually for VOAs.

D. The labor and expenses and QA/QC follow the same procedures as outlined for year 1.

__General Note__

All of the monitoring wells should be analyzed for the full TCL at least every five years (if not more frequently) to evaluate the effectiveness of the alternative. The cost for this analysis and sampling is not included in the total cost for this alternative.

EXHIBIT 22

F. Level C safety protection is to be used unless downgrading is approved by the site Health and Safety Coordinator.

G. Three hours per well allowed for well development.

H. All cuttings are to be contained in drums. The drums are to be transported to a secure location onsite for storage.

I. Mob/demob includes all costs to the driller to complete the work, obtain permits, create access, allow an appropriate per diem and pay for incidential costs.

J. Three hours per well is allowed for proper decontamination of drilling and sampling equipment.

K. Expected time frame to complete the well installations is:

- 30 hours per shallow well
- 50 hours per intermediate well
- 80 hours per deep well

L. Two rigs are used for drilling.

3. Ground Water Sampling

Year 1

A. The injection well will be sampled for the full Target Compound List (TCL). The existing monitoring wells will be sampled for TCL volatiles (VOA) and any floating product for TCL volatiles and semi-volatiles.

B. The unsaturated zone wells will be sampled for VOAs. It was assumed that 4 of these wells would have floating product which would be analyzed for the TCL volatiles and semi-volatiles.

C. After the installation of the monitoring wells all of the wells installed as part of the RI, along with the additional wells installed upgradient, downgradient, and onsite will be sampled for the full TCL and the following conventional parameters:

- BOD
- COD
- Ammonia-N
- Phosphates
- pH
- TSS
- TS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
Post Office Box 2063
Harrisburg, Pennsylvania 17120

Deputy Secretary for
Environmental Protection

717-787-5027

June 30, 1988

Stephen R. Wassersug, Director
Hazardous Waste Management Division
EPA Region III
841 Chestnut Building
Philadelphia, PA 19107

Re: Letter of Concurrence
Henderson Road Superfund Site, Record Of Decision (ROD)

Dear Mr. Wassersug:

The Record Of Decision for the Henderson Road site has been reviewed by the Department. I hereby concur with the EPA's proposed remedy, with the following conditions:

- EPA will assure that the Department is provided an opportunity to fully participate in any negotiations with responsible parties.
- The Department will be given the opportunity to concur with decisions related to the design of the remedial action, to assure compliance with DER design specific ARARs.
- The Department will be given the opportunity to concur with decisions related to implementing any downgradient pump and treat action, any action for the unsaturated soil zone, and any change in cleanup targets, in order to assure compliance with DER cleanup ARARs.
- The Department will reserve our right and responsibility to take independent enforcement actions pursuant to state law.

* This concurrence with the selected remedial action is not intended to provide any assurances pursuant to SARA Section 104(c)(3).

Thank you for the opportunity to concur with this EPA Record Of Decision. If you have any questions regarding this matter please do not hesitate to contact me.

Sincerely,

Mark M. McClellan